Third Five-Year Review Report

for
Washington County Landfill
Lake Elmo
Washington County, Minnesota

April, 2004

PREPARED BY:

U. S. EPA - REGION 5

Approved by:

Richard C. Karl
Acting Director, Superfund Division

4/2/04
Date

[This page intentionally left blank.]

Table of Contents

List of Acronyms 5

Executive Summary 7

Five-Year Review Summary Form 8

I. Introduction 11

II. Site Chronology 12

III. Background 13
Physical Characteristics 13
Land and Resource Use 13
History of Contamination 13
Initial Response 13
Basis for Taking Action 14

IV. Remedial Actions 15
Remedy Selection 15
Remedy Implementation 16
System Operations/Operation and Maintenance (O&M) 16

V. Progress Since the Last Five-Year Review 19

VI. Five-Year Review Process 19
Administrative Components 19
Community Notification and Involvement 19
Document Review .....
Data Review 19
Site Inspection 21
Interviews 21

VII. Technical Assessment 21
Question A: Is the remedy functioning as intended by the decision documents? 22
Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid? 22
Question C: Has any other information come to light that could call into question the protectiveness of the remedy? 22
Technical Assessment Summary 22

VIII. Issues 23

IX. Recommendations and Follow-up Actions 23

X. Protectiveness Statement(s) 24

XI. Next Review 24

Tables

Table 1 - Chronology of Site Events
Table 2 - Annual System Operations/O&M Costs
Table 3 - Issues
Table 4 - Recommendations and Follow-up Actions

Attachments

Site Map Showing
Attachment 1
Table 5 Groundwater Elevations, 2001 and 2002
Table 6 Totals VOCs 2001-2002
Table 7 Vertical Gradient Report
Table 8 Compliance with ARARS in micrograms per liter
Table 9 Monthly Volume of Groundwater Extracted from the Gradient Wells
Table 10 Total Pounds of Volatile Organic Compounds removed

Figures 3 through 23 for 2001 and 2002

Table 1 Flare Parameters collected in 2003
Table 2 Landfill Gas Probe Monitoring for 2003
Table 3 Analytical Data
Table 5 Groundwater elevations, 2003
Table 6 Total Volatile Organic Compound calculated at each well, Year 2003
Table 7 Vertical Gradient Report
Table 8 Compliance with Applicable and Relevant of Appropriate Requirements
Table 9 Monthly Volume Pumped from GC-1 and Pounds of VOCs removed

List of Acronyms

ARAR	Applicable or Relevant and Appropriate Requirement
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
EPA	United States Environmental Protection Agency
FSR	Final Site Remedy
HRL	Health Risk Limit
GCL	Geosynthetic Clay Liner
GWOU	Groundwater Operable Unit
MCL	Maximum Contaminate Limit
MHD	Minnesota Health Department
MPCA	Minnesota Pollution Control Agency
NPDES	National Pollutant Discharge Elimination
NPL	National Priority List
NOC	Notice of Compliance
O & M	Operation and Maintenance
PAH	Polyaromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCOR	Preliminary Close Out Report
PRP	Potentiall Responsible Party
PSFD	Pilot Scale Field Demonstration
RA	Remedial Action

RCRA	Resource Conservation and Recovery Acg
RD	Remedial Design
RAO	Remedial Action Objective
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
SCOU	Source Control Operable Unite
VOC	Volatile Organic Compounds

Executive Summary

A Response Action Plan (RAP) was developed and was set forth in a Response Order by Consent (Order) approved by MPCA on October 24, 1984. The purpose of the RAP was to establish procedures for implementing response actions at the Washington County Landfill (landfill). The specific purposes of the RAP were to : (1) capture groundwater contaminated by volatile organic hydrocarbons in the glacial drift that had migrated from the landfill and prevent the further release of contaminated groundwater beyond the boundary of the landfill, (2) treat any collected contaminated groundwater through operation of an air stripping treatment system, (3) monitor groundwater to determine the effectiveness of the response actions and ensure protection of residential wells, and (4) provide residents with a safe drinking water supply.

The assessment of this five-year review found that the remedy was constructed in accordance with the requirements of the RAP. A Record of Decision (ROD) was signed on November 15, 1990, for OU2 of the site. The selected remedy for this site was a municipal drinking water supply system to supply potable drinking water to residents of 10 homes in Lake Elmo which have received Minnesota Department of Health (MDH) drinking water well advisories to not use their existing well water for drinking or cooking. The selected remedy for the first operable unit, a gradient control well and spray-irrigation system, was installed as a result of the RAP and has been operational since December 1983. The municipal drinking water supply system will provide safe drinking water to those residents whose well water has been determined to be unsafe for drinking by the MDH. The selected remedy addressed the principal threat of ingestion of contaminated water posed by releases of contaminants from the Site. Operation of the gradient control well and spray-irrigation treatment system will continue to prevent further releases into the aquifers downgradient of the landfill and to treat the contaminated water captured by the pump out system. The remedies are functioning as designed.

Five-Year Review Summary Form

SITE IDENTIFICATION

Site name ***(from WasteLAN)***: Washington County Landfill

EPA ID ***(from WasteLAN)***: MND980704738

Region: 5	**State:** MN	**City/County:** Washington County

SITE STATUS

NPL status: Final x Deleted Other (specify) _____

Remediation status (choose all that apply): ☐ Under Construction ☐ Operating x Complete

Multiple OUs?* x YES ☐ NO	**Construction completion date:** 09 / 27/1995

Has site been put into reuse? ☐ YES x NO

REVIEW STATUS

Lead agency: EPA x State Tribe Other Federal Agency _____

Author name: Gladys Beard

Author title: NPL State Deletion Process Manager	**Author affiliation:** U. S. EPA, Region 5

Review period:** 01 /01 /2002 to 4/16/04

Date(s) of site inspection: February 27, 2004

Type of review:

☐ Post-SARA x Pre-SARA ☐ NPL-Removal only
☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead
☐ Regional Discretion

Review number: 1 (first) (second) x (third) Other (specify) _____

Triggering action:

☐ Actual RA Onsite Construction at OU #____ ☐ Actual RA Start at OU#____
☐ Construction Completion x Previous Five-Year Review Report
☐ Other (specify) _____

Triggering action date ***(from WasteLAN)***: 04 /16 /1999

Due date ***(five years after triggering action date)***: 04 /16 /2004

* ["OU" refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

FIVE-REVIEW SUMMARY FORM, cont'd

Issues:

- Altering the discharge of the pumped groundwater from spray irrigation system/seepage basin to a sedimentation pond followed by an infiltration bed.

- MPCA has to install a new groundwater control well and pump (GC-5). The spray irrigation system will be kept operational and used as an emergency back up in case the pond/infiltration bed needs to be shut down for some reason.

- The new system is to be installed on property owned by the State and is directly south of the Washington County Landfill. It is the MPCA intention to have the construction completed and the new system up and running by June 30, 2004.

Recommendations and Follow-up Actions:

- The gradient control system provides adequate gradient control in the area from V/V2 to E but appears to pump out more groundwater than is necessary. Groundwater performance standards continue to exceed in these areas even though the water quality at the gradient controls wells in the fill do not exceed standards.

- The plume appears to be stable at EE with a declining trend in Total Volatile Organic Compounds and only vinyl chloride exceeding standards. Manganese and arsenic exceeded the standards in specific monitoring wells and in the treatment area in 2001, but only the groundwater standard was exceeded at V2 in 2002.

- New gradient control wells placed in the plume, a new lined sedimentation basin and infiltration basin are recommended for design and construction.

- Continue with routine site maintenance including annual mowing of the vegetative cover, site inspections of cover and integrity of cover. Continue with groundwater and surface water sampling program.

Protectiveness Statement(s):

All immediate threats at the site have been addressed, and the remedy is protective in the short-term of human health and the environment.

Long-Term Protectiveness:

Long-term protectiveness at the Washington County Sanitary Landfill Superfund site (the

Site) will be achieved by continuing the long-term monitoring of the groundwater system. Long-term groundwater monitoring has demonstrated that the concentrations of the chemicals of concern have declined close to or below cleanup goals. Long-term trends show significant and adequate improvements in ground water quality.

Other Comments:

None.

Washington County Sanitary Landfill, Superfund Site
Andover, Minnesota
Third Five-Year Review Report

I. Introduction

The purpose of the five-year review is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues found during the review, if any, and identify recommendations to address them.

The Agency is preparing this Five-Year Review report pursuant to CERCLA §121 and the National Contingency Plan (NCP). CERCLA §121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgement of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The Agency interpreted this requirement further in the NCP; 40 CFR §300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

The Minnesota Pollution Control Agency (MPCA) and the United States Environmental Protection Agency (EPA), Region 5, conducted the five-year review of the remedy implemented at the Site. This review was conducted by the Project Managers for the entire site from January 2003 through April 2004. This report documents the results of the review.

This is the third five-year review for the Site. The triggering action for this five-year review is the completion of the second Five Year Review in April 16, 1999. The five-year review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure.

II. Site Chronology

Table 1: Chronology of Site Events

Event	Date
Removal Assessment	04/14/93
Proposal to the NPL	09/08/93
PRP NPL listing	09/21/84
NPL Search	01/31/94
RI/FS Complete	10/24/84
Record of Decision OU1	10/24/84
Record of Decision OU2	11/15/90
Remedial Design Complete OU1	10/24/84
Remedial Design Complete OU1	10/18/93
Remedial Design Complete OU2	06/24/91
Remedial Action Complete OU1	01/16/92
Remedial Action Complete OU2	O1/16/92
Preliminary Close Out Report	09/30/92
Deletion from NPL	05/16/96
Second Five Year Review	04/16/99

III. Background

Physical Characteristics

The Washington County Landfill Site (Site) is located within the city limits of Lake Elmo in Washington County approximately nine miles northeast of downtown St. Paul.

In 1968, Washington County purchased a 110 acre site in Lake Elmo and designated 40 acres of the Site as a sanitary landfill disposal area. An area of approximately 35 acres was filled with solid waste to an average depth of approximately 30 feet. It is estimated that 2.57 million cubic yards of solid waste excluding cover material has been disposed of in the landfill. The solid waste is estimated to be comprised of 73 percent residential wastes, 26 pecent commercial wastes and 1 percent demolition wastes.

Land and Resource Use

The area adjacent to the landfill is predominantly residential, with some areas used for farming. There is a city park to the east of the landfill. The Site does not lie within a flood plain and there are no wetlands or surface waters on the Site. Lake Jane is located 250 feet north of the northern edge of the landfill property boundary. There are approximately 3,000 people living within a three mile radius of the Site.

The landfill is located in a gently sloping area characterized as glacio-fluvial in origin. The Site is underlain by sand and gravel deposits. These deposits constitute an unconfined aquifer in the study area. The St. Peter Sandstone and Prairie du Chien Dolomite aquifers underlie the glacio-fluvial aquifer at the Site. Groundwater flow in the upper sand and gravel aquifer is generally to the south away from Lake Jane.

History of Contamination

The site was extensively mined for sand and gravel prior to its use as a sanitary landfill during the years 1969 thru 1975. The landfill was operated jointly by Washington and Ramsey Counties ("the Counties"), which accepted approximately 2.6 million cubic yards of solid waste. The solid waste is estimated to be 73% residential waste, 26% commercial waste, and 1% demolition waste.

In 1983, four nearby private drinking water wells, southwest and downgradient of the landfill, were found to have levels of one or two VOCs above or near drinking water well guidelines requiring private drinking water well advisories from the Minnesota Department of Health (MDH).

Initial Response

In May 1989, the MPCA issued a National Pollutant Discharge Elimination System (NPDES) permit to Washington County for an off-site discharge from one of the gradient control wells, into Eagle Point Lake. During the NPDES permit application process in 1988, the Counties sampled the

well for a more extensive list of possible contaminants that was being used to monitor the groundwater at this time. Based on the contaminants detected in 1988 and 1989 in the groundwater, the MPCA requested that the MDH reassess the health risk to the residents from drinking the contaminated groundwater. After additional residential well sampling in early 1989 and based upon a different health risk criterion - the presence of four or more contaminants at any measurable level - 10 new drinking water well advisories were issued. Contaminants in these wells were all below their respective Recommended Allowable Limits (RALs) established by the MDH. During this period, it at first appeared that elevated levels of lead were also present in residential drinking water, but elevated levels were subsequently determined to be caused from contaminated bottles used by the Counties' laboratory.

In March 1990, based upon the updated sampling results from the sampling done in 1989 and the early part of 1990 and the new drinking water well advisories, the MPCA staff, as a part of the MPCA approval of the 1989 Annual Ground Water Monitoring Evaluation Report, requested that the Counties re-evaluate the long-term drinking water supply plans of October 1985 and May 1986. The Counties responded to this request in a document entitled, "Long-Term Drinking Water Supply Plan, Washington County Sanitary Landfill No. 1," dated June 30, 1990. This report constitutes the Remedial Investigation/Feasibility Study (RI/FS) Report for the purpose of the Record of Decision (ROD).

Basis for Taking Action

Contaminants

Hazardous substances that have been released at the Site in each media included:

Soil and Groundwater

Acetone
Benzene
Chloroform
Chloromethane
Cis-1,2-dichloroethlene
Chloroform
1,1 Dichloroethane
1,1-Dichloroethylene
1,1,1-trichloroethane
Dichlorofluoromethane
Methylene chloride
Trichlorofluoromethane
Trichloroethyllene
Tetrachloroethlene
1,1,1 trichloroethane
Xylene

IV. Remedial Actions

Remedy Selection

On October 24, 1984, the Counties and MPCA signed a Response Order that part of the RAP by Consent which required the following:

Installation and operation of a groundwater gradient control system, which captured contaminated groundwater and prevented further movement of contaminants off-site;

Installation and operation of an air stripping system for VOCs in the captured groundwater;

Monitoring of the landfill and area groundwater to ensure the effectiveness of the gradient control system and the protection of residential wells; and

Provision of safe drinking water supplies to residents whose private wells contained substances in excess of Minnesota private drinking water well criteria. An interim water supply was required immediately and a permanent supply was to be developed.

On November 15, 1990, a Record of Decision was signed for the second operable unit of the Washington County Landfill. The major components of the selected remedy were as follows:

Continued operation of the gradient control well and spray-irrigation treatment system which consists of four gradient control wells, two on-site spray-irrigation treatment areas, and off-site discharge of groundwater from one pump out well which operates under National Pollutant Discharge Elimination System Permit MN0054348, dated May 4, 1989.

Connection of 10 homes with MDH drinking water well advisories to the City of Oakdale municipal water supply system.

Remedy Implementation

In 1975 the landfill was closed, a landfill cover was installed at that time. The cover consisted of 2 feet or more of final cover. In 1996, the cover was upgraded to current standards including a geomembrane, sand drainage layer, rooting zone, and topsoil with shallow rooted grasses. Construction of monitoring wells, a gradient control well, and the air stripping system were accomplished in sequence with the investigations during 1982 and 1983. The gradient control system began full operations on December 12, 1983. This construction was implement during Phase I thru Phase IV of the investigations. The system consisted of one gradient control well near the south west corner of the landfill, designed to extract 200 gallons per minute, and a spray irrigation area in the southeast portion of the site. The spray irrigation area consisted of an area of 1.9 acres with sandy soils. This area was believed to be contained within the capture zone of the gradient control system. At this time, approximately 27 monitoring wells had been installed and an

additional 25 residential wells were being monitored for the presence of contaminants.

In a report provided in February 1984 the first evaluation of the performance of the system, regular evaluations, modifications, and improvements to the system continued after 1984. During this time, the gradient control system was expanded to include 4 wells capable of extracting a maximum of 400 gallons per minute, berms were constructed and other improvements were made to increase infiltration of treated groundwater at the treatment area, and an off-site discharge was added for some extracted groundwater. A backup treatment area was added and used while the primary treatment area was down for maintenance. The number of monitoring wells was expanded to 38.

Contracts were awarded for construction of the water supply system and residential well abandonment on June 4, 1991. Construction of the water supply system was initiated on June 25, 1991. Connection of the ten residences with drinking water advisories to the system was completed on December 31, 1992. Connection of 72 of the remaining 73 residences was completed by June 1992.

System Operation/Operation and Maintenance

There are 24 gas monitoring points to monitor for the presence of landfill gas generated by the Washington County Sanitary Landfill. Landfill gas migration was controlled adequately by the active gas extraction system. The flare has operated 91 percent of the time in the last 2 years. The Operation and Maintenance contractor, Conestoga-Rovers & Associates (CRA), monitors the probes quarterly. Methane was detected in MV11 and G6B in September 2001. This detection was attributed to flare shutdown. Methane was also detected in January 2002 in MV8, MV11, G9C, G12A, G12B, and G13A. It has not been detected in the probes for the remainder of 2002.

In 2003, the Landfill gas migration was controlled adequately by the active gas extraction system. The flare has operated 95 percent of the time in the last year. All monitoring wells were developed in the spring of 2000 and the submersible pumps were removed so that dedicated Grundfos pumps could be installed in the wells. Dedicated Grundfos RediFlo pumps were installed in wells I, J, D1, D, V2, V, Q1, Q2, Q3, R1, R2, R3, and L in the spring and summer of 2000. In the summer of 2001 the dedicated Grundfos pump in D was moved to well A. The dedicated Grundfos pump in J was moved to E in the spring of 2002.

Tables 5 and 6 have been prepared to show parameters detected, groundwater elevation data, and total concentrations of Volatile Organic Compounds (VOCs) for each of the wells monitored. Review of ground water data indicates that the groundwater flow direction in the surficial aquifer varied from south to southwest and south to southeast in the two year period. There is mounding visible near the treatment area and around well nest D and D1. At the base of the surficial aquifer, the flow direction is to the southeast in the year 2001 and has components to the southwest and to the southeast (downgradient of the landfill) in 2002. There is mounding at the V/V2 nest in 2001 and early 2002 but this shifts in late 2002 to the area around well Z. The irregular components of flow near the landfill may be due to influx of water into the aquifer upgradient of well E. In the Prairie du Chien the flow is to the south. Figures 3 through 7 present the groundwater contours as

developed in 2001 and 2002 for the shallow, deep, and Prairie du Chien wells respectively that are representative of all events. The maps developed for the base of the surficial aquifer indicate that the change in location of the gradient control well to GC-1 and the infiltration of treated water is ponding around well V/V2 and Z at different times during the year. The horizontal hydraulic gradient in the surficial aquifer became steeper by an order of magnitude in 2001 through 2002 ranging from 0.016 to 0.049. In all the other aquifers beneath the site, hydraulic gradients remained very flat over the past two years and explain why flow directions change easily with the influx of treated water. The horizontal hydraulic gradient at the base of the surficial aquifer varied from 0.001 to 0.008. The gradient in the Prairie du Chien aquifer flattened in 2002 and was 0.0002.

The vertical hydraulic gradient may be influenced by proximity to the gradient control wells (if they are within 100 feet) and recharge area from treated ground water (see Table 7). A change to the gradient control pumping occurred in June 2001 based on responses seen in well nest V and V2 by pumping at GC-1. GC-1 was the only gradient control well operating after June 2001 in an effort to capture more of the plume and not capture treated water with the gradient control wells. Well nest Q may be in an area that is impacted by pumping. Data from 2001 through 2002 continues the trend seen in 2000 with the exception that the gradient at the interface of the surficial aquifer and the Prairie du Chien is downward and averages 0.01 (with one exception from the fall of 2002 that is upward). The vertical gradient near Q resembles the horizontal gradient in magnitude, averages-0.005 in 2001 and -0.038 in 2002 and was upward. At well nest R the vertical gradient was downward through 2002. Vertical gradients at R reflect influence by recharge in Treatment Area 1 and averaged 0.005 in the upper portions of the surficial aquifer and 0.004 at the Prairie du Chien interface. This continues the trends seen before and may indicate that pumping at G3 was having little impact on this well nest (since it has not been pumping since May 2000). The vertical gradient at the V nest was consistently downward in 2001 through 2002, continuing the trend of 2000. The gradient has become steeper by an order of magnitude reflecting the influence of GC1 (the downward movement may reflect when the pump is operating). The average gradient was 0.014. Farther downgradient, at nest BB2 and BB3, the average vertical gradient is 0.0024 at the Prairie du Chien interface.

Laboratory analyses of inorganic and organic parameters were performed by the Minnesota Department of Health (MDH). Graphs showing trends in water quality and ground water elevations are included in Figures 8 through 22. As ground water concentrations of contaminants drop below the Health Risk Limits (HRLs), the ground water pumpout system can be reevaluated. Ground water samples collected from monitoring wells have shown impacts from both inorganic and organic parameters.

Inorganic parameters that exceeded the Health Based Value or Maximum Contaminant Level include manganese and arsenic (Table 8). These parameters exceeded the infiltration standards in Treatment Area 1 in 2001 but not 2002. The greater volume of water from GC-1 may explain compliance in 2002. Manganese is exceeded in select monitoring wells. It exceeded the HBV in E in 2001 but not in 2002. Manganese is increasing in concentration in V2 through 2002 and is exceeding the standard over the 2 year period. However, it does not exceed the standard at the shallow well in the nest (V). Manganese also exceeds the standard at R3 through the 2 year period.

Organic parameters that exceeded the Health Risk Limit include benzene and vinyl chloride. Benzene exceeded the standard in 2001 at V2 but not in 2002. Vinyl chloride exceeded the standard in V over the two year period but not at V2. Vinyl chloride was also a parameter of concern at EE (the southern edge of the plume) averaging 1.7 micrograms per liter.

For 2003, tables 5 and 6 show parameters analyzed, groundwater elevation data, and total concentrations of Volatile Organic Compounds (VOCs) for each of the wells monitored. The vertical hydraulic gradient may be influenced by proximity to the gradient control well and to the infiltration basin (see Table 7). GC-1 was the only gradient control well operating in 2003. The vertical gradients measured between the water table and the next lower level all indicate a downward gradient regardless of whether the wells are up or downgradient of the fill area. However, the gradients measured downgradient are steeper by one to three orders of magnitude. Treated water infiltrating back into the aquifer flows to the west and this is reflected by strong vertical gradients seen at well nest V and well nest R. The vertical gradients measured between mid-depth and the base of the surficial aquifer downgradient of the fill area indicated upward gradients to the west and a downward gradient to the east.

Manganese is the only inorganic parameter that exceeded the Health Based Value in 2003 (Table 8). Infiltration standards for inorganic parameters were not exceeded in Treatment Area 1 in 2003. The manganese standard is exceeded in monitoring wells V, V2, and R3 in 2003. In each exceedance there were reducing conditions in the well (i.e. the oxidation reduction potential was negative). Plots of Eh trends compare to the precipitation graph suggest that precipitation affects the oxidation reduction potential conditions. When there is less precipitation the geochemical conditions become reducing in the aquifer.

Vinyl chloride was the only organic parameter that exceeded the Health Risk Limit in 2003. The Standard was exceeded upgradient during each event but downgradient only during the spring and summer. The violation upgradient does not appear to be related to the fill area since the flow at the northwest corner is to the east-northeast. Vinyl chloride exceeded the standard in V but not at V2. Vinyl chloride was also a parameter of concern a EE (the southern edge of the plume) averaging 1.1 micrograms per liter. This is a reduction from the previous two year period.

Table 2 - Annual System Operations/O&M Costs

Dates		Total Cost
From	To	
7/2001	6/2002	$ 346,354
7/2002	6/2003	$ 127,641

V. Progress Since the Last Five-Year Review

During the past Five-Year Review the MPCA recommended that the spray irrigator be utilized until the remediation system being installed at Anoka Sanitary Landfill is evaluated for effectiveness. If the system at Anoka appeared to work year-round then a constructed wetland operated the entire year would be installed at Washington County Landfill to replace the spray irrigator. The MPCA plans to install a low profile air stripper with exhaust going to the enclosed flare and discharge to an infiltration basin pond. The system at Anoka Sanitary Landfill has operated effectively for the past two years. The MPCA has 95% of the design done for the Washington County Landfill.

VI. Five-year Review Process

Administrative Components

This Five-Year Review Report was written and completed by EPA, based on the technical review of the Site by members of the MPCA staff. This Five-Year Review Report was written by Gladys Beard of EPA.

From January 1, 2003 to December 31, 2003 the review team established the review schedule whose components included:

- Community Involvement;
- Document Review;
- Data Review;
- Site Inspection;
- Local Interviews; and
- Five-Year Review Report Development and Review.

Community Involvement

Notice will be made to the public announcing the Five-Year Review Report start and completion providing a summary of Five-Year Review findings, protectiveness of the remedy, and advising the community where a copy of the review report can be found. This Five-Year Review Report can be found in the Site's Information Repository.

Document Review

This Five-Year Review consisted of a review of relevant documents including O&M records, monitoring data, and the MPCA's Annual Report from the last five years and the last two Five-Year

Review Reports. All cleanup standards in the ROD were reviewed and the applicable or relevant and requirements were reviewed for this Site. (See Attachment 1).

Data Review

Groundwater Monitoring

A groundwater remediation system is in operation at the Washington County Landfill. The ground water remediation system includes 4 pumpout wells. Wells GC4 and GC2R were primarily utilized prior to June 2001 since they are located within the fill area. However, contaminant concentrations in these wells reached asymptotic levels and a mini pump test was utilized with GC-1 with measurements collected in the nest of V and V2 (well nest at the center of the plume) and EE (well at southern edge of plume). The results of the pump test indicated that GC-1 could capture contaminants in the plume and it commenced operation in June 2001. See Table 9 for flow rates and volume pumped out of the gradient control wells. GC-1 was offline from December 12 through the end of the year.

Gradient control through the two year period was primarily accomplished with GC-1. The volume of ground water removed in 2001 was 52,443,809 gallons and in 2002 was 67,700,201 gallons. There has been a 45 percent increase in the amount withdrawn from 2000 to 2002. Using concentrations of Volatile Organic Compounds (VOCs) found in these gradient control wells, it was estimated that 27.5 pounds of VOCs were removed from the ground water in 2000, 11.9 pounds in 2001 and 12.9 pounds in 2002. The reduction reflects the greater volume of uncontaminated ground water captured near GC-1. A summary is included in Table 10.

The site was developed on an old gravel mining operation that had several active pits. An aerial photograph taken of the site in 1969 (at the end of the site's life as a gravel mining operation and the beginning of the site as a solid waste facility) shows several pits with ground water in them and garbage placed in ground water. Ground water remediation is challenging when the source may be below the ground water. Active gas extraction stabilizes waste above the water table and has little impact on waste in ground water.

Graphs of total volatile organic compounds in the gradient control wells indicate several things (see Figures 11 through 13). The contaminant concentration in GC-2 and GC-4 (screened in the fill area) decrease as the water levels decrease over the two year period. These figures support that there is not a link between precipitation and what is found beneath the fill area in the ground water. This may suggest for the first time that the active gas extraction system and cover system impact the concentration of volatile organics in the gradient control wells that are in waste since there is a decrease in the ground water elevation despite the 2001 reading reflecting a wet trend and the 2002 reading reflecting a dryer trend (see Figure 23). The trends observed at GC-1 (which are not shown) indicate increasing contamination with increasing ground water elevation for data in 2002. This may reflect capture in the gradient control well. Further data is needed to assess the validity of the trend. A graph at EE can be used as a measure of the behavior of wells outside of the fill area and still impacted by contamination (Figure 10). The trend at EE over the last two years has been a declining trend with a small peak on October 2001 (this reverses what had been previously seen at this well). The peak may indicate precipitation mobilizing the plume. The plume appears to be stable at EE and this may indicate that pumping at GC-1 is

having an effect on the plume.

GC-1 appears to be having an impact on the plume in the downgradient direction and may be stabilizing the plume around well EE. The gradient control well and treatment system must continue to operate to prevent the migration of a plume downgradient but a new gradient control well[s] may need to be installed to pump directly in the plume.

Surface Water and Sediment Monitoring

The pump out water from gradient control well GC-1 is discharged to Treatment Area 1 through a spray irrigator. The pump out water infiltrates to ground water and mounds around the treatment area and around the R and V nest at different times of the year. Since the ground water infiltrates on-site and the site is operated by the MPCA, the NPDES permit had been allowed to expire.

However, NPDES monitoring still occurs to ensure that pumpout water meets Health Risk Limits (or in their absence MCLs or HBVs) prior to infiltration and complies with nondegradation statutes (Minn. ch. 7060).

The standards exceeded in 2001 in the Treatment Area include Arsenic, Iron (standard in expired NPDES permit) and Manganese. Arsenic was not detected farther downgradient at E. Iron was detected at E at a reduction of up to 2 orders of magnitude.

There were no standards exceeded in 2002. This reduction may reflect pumping of both contaminated and uncontaminated ground water that is discharged to Treatment Area 1.

Site Inspection

Inspections were conducted on a weekly basis by MPCA staff and the Operation and Maintenance (O&M) contractor hired by the MPCA. All aspects of the flare; checked the extraction well system, found the irrigator spray head okay and the flow volume of the gradient control wells, found the access roadway okay and checked the autodialer setting for call out functions.

Interviews

In processing this report, U. S. EPA interviewed the MPCA to obtain information. None of the MPCA staff was able to identify any concerns regarding the Site and there had not been any emergency responses at the Site.

VII. Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

Yes, the review of documents, ARARS, risk assumptions, and the results of the site inspection indicates that the remedy is functioning as intended by the ROD. The stabilization and capping of

the contaminated landfill have achieved the remedial objectives to minimize contaminants to groundwater and surface water and prevent direct contact with, or ingestion of, contaminants in soil and groundwater. The effective implementation of institutional controls has prevented exposure to, or ingestion of, contaminated groundwater.

Operation and maintenance (O.M.) of the cap and groundwater have been effective. O.M. annual costs are consistent with original estimates and there are no indications of any difficulties with the remedy.

No activities were observed that would have violated the institutional controls. The cap and the surrounding area were undisturbed, and no new uses of groundwater were observed. The fence around the Site is intact and in good repair.

Question B: Are the exposure assumptions, toxicity data cleanup levels and remedial action objectives (rads) used at the time of the remedy selection still valid?

Changes in Exposure Pathways, Toxicity, and Other Contaminant Characteristics

Yes, the exposure assumptions used to develop the Human Health Risk Assessment included both current exposures (older child trespasser, adult trespasser) and potential future exposures (young and older future child resident, future adult resident and future adult worker). There have been no changes in the toxicity factors for the contaminants of concern that were used in the baseline risk assessment. These assumptions are considered to be conservative and reasonable in evaluating risk and developing risk-based cleanup levels. No change to these assumptions, or the cleanup levels developed from them is warranted. There has been no change to the standardized risk assessment methodology that could affect the protectiveness of the remedy. The remedy is progressing as expected and it is expected that all groundwater cleanup levels will be met within approximately the time frame stated in the ROD.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No ecological targets were identified during the baseline risk assessment and none were identified during the five-year review, and therefore monitoring of ecological targets is not necessary. All groundwater and surface water samples analyzed found no contamination of wetlands or surface water. No weather related events have affected the protectiveness of the remedies. There is no other information that calls into question the protectiveness of the remedies. There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy.

Technical Assessment Summary

According to the data reviewed, the site inspection, and the interviews, the remedies are functioning as intended by the ROD. There are no changes in the physical conditions of the site that would affect the protectiveness of the remedy. There have been no changes in the toxicity factors for the

contaminants of concern that were used in the baseline risk assessment, and there have been no changes to the standardized risk assessment methodology that could affect the protectiveness of the remedies. There is no other information that calls into question the protectiveness of the remedies.

VIII. Issues

Table 3: Issues

Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
Altering the discharge of the pumped groundwater system	N	Y
Install a new groundwater control well pump	N	Y
Continue with maintenance of the landfill	N	Y

IX. Recommendations and Follow-up Actions

Table 4: Recommendations and Follow-up Actions

Issue	Recommendations and Follow-up Actions	Responsible Party	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
Continue with Monitoring	Continue groundwater and surface water sampling	MPCA	MPCA	Quarterly	N	Y
Install a new groundwater control pump	to help the control of the groundwater	MPCA	MPCA	6/30/2004	N	Y

Issue	Recommendations and Follow-up Actions	Responsible Party	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
Change irrigation system	Install pond/infiltration bed	MPCA	MPCA	6/30/2004	N	Y

X. Protectiveness Statement(s)

All immediate threats at the site have been addressed, and the remedy is protective in the short-term of human health and the environment.

Long-term protectiveness at the Washington County Sanitary Landfill Superfund site (the Site) will be achieved by continuing the long-term monitoring of the groundwater system. Long-term groundwater monitoring has demonstrated that the concentrations of the chemicals of concern have declined close to or below cleanup goals. Long-term trends show significant and adequate improvements in ground water quality.

XI. Next Review

The next five-year review for the Site will be completed five years from this report in April 2009.

Attachment 1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) REVIEW

Five-Year Review guidance established policy for EPA to review and analyze the remedial action at a site as it is affected by newly promulgated or modified federal and state environmental laws. Applicable or Relevant and Appropriate Requirements (ARARs) associated with the construction and long-term maintenance and monitoring of the remedial actions at the Site were not addressed in the Consent Order. However, the Consent Order mandated that "...the actions to be taken pursuant to this Order are reasonable and necessary to protect the public health or welfare or the environment..." The Administrative Order also does not identify ARARs, however, it requires the Counties to perform remedial actions originally undertaken pursuant to the Consent Order. The remedial actions must meet all identified ARARs and more stringent state requirements (To-Be-Considered criteria).

ARARs for the Site are listed as follows.

A. Long-Term Water Supply

1. Safe Drinking Water Act (SDWA), 40 CFR Parts 141-143. Establishes Maximum Contaminant Levels for ground water remediation.

2. Minnesota Rules ch. 4715. Minnesota plumbing code. Establishes plumbing standards for water systems.

3. Minnesota Rules ch. 4720. Minnesota public water supply code. Establishes standards for construction, treatment, and monitoring of public water supplies.

4. Minnesota Rules ch. 4725. Water well code. Establishes standards for the construction, maintenance and sealing of wells.

B. Ground Water Remedial Action

1. SDWA, 40 CFR Parts 141-143.

2. Minnesota Rules ch 4715.

3. Minnesota Rules ch. 4725.

4. Minnesota Stat. Section 115.03. Establishes MPCA authority to require and

enforce a permit to discharge to the waters of the state.

5. Minnesota Stat. Section 115.063. Establishes protecting ground water as a potable water source.

6. Minnesota Stat. Section 115.44. Classifies surface water of the state.

7. Minnesota Rule 7001.050. Establishes terms and conditions of the NPDES permit.

8. Minnesota Rule 7050.0150. Determination of Compliance. Establishes need to determine composition of effluents, etc.

9. Minnesota Stat. Section 103H. 1989 Ground Water Protection Act. Establishes the goal of non-degradation of ground water.

10. Minnesota Rules pts. 4717.7100 - 4717.7650. Rules establishing Minnesota Health Risk Limits (HRLs).

C. Ground Water Monitoring Well Network

1. SDWA, 40 CFR Parts 141-143.

2. Minnesota Rules ch. 4715.

3. Minnesota Rules ch. 4725.

D. Landfill Closure and Post-Closure Remedial Action

1. Minnesota Stat. Section 116.061. Establishes duty to notify and abate unusual or excessive releases to the air.

2. Minnesota Rules chs. 7005 and 7010. Establishes air pollution standards.

3. 40 CFR Part 122.26. Establishes storm water runoff requirements for landfills.

To-Be-Considered (TBC) criteria for the selected remedy are listed as follows.

A. Long-Term Water Supply

1. Minnesota Department of Health Recommended Allowable Limits (RALs), Release No. 3. Establishes contaminant specific performance standards for ground water remediation.

B. **Ground Water Remedial Action**

1. MDH RALs.

2. Minnesota Rules Chs. 7001 and 7035. Minnesota solid waste management rules. Establishes closure and post-closure requirements for permitted sanitary landfills.

3. MPCA draft guidance document entitled "Air Emissions from Remedial Sites and Landfills," dated September 1992. Establishes requirements for air emissions from landfills and from stack emissions from remedial treatment systems.

C. **Ground Water Monitoring Well Network**

1. MDH RALs.

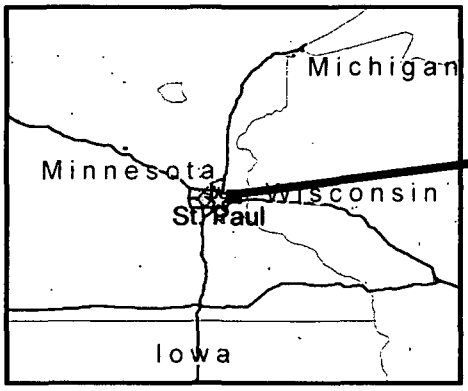
D. **Landfill Closure and Post-Closure Remedial Action**

1. Minnesota Rules Chs. 7001 and 7035.

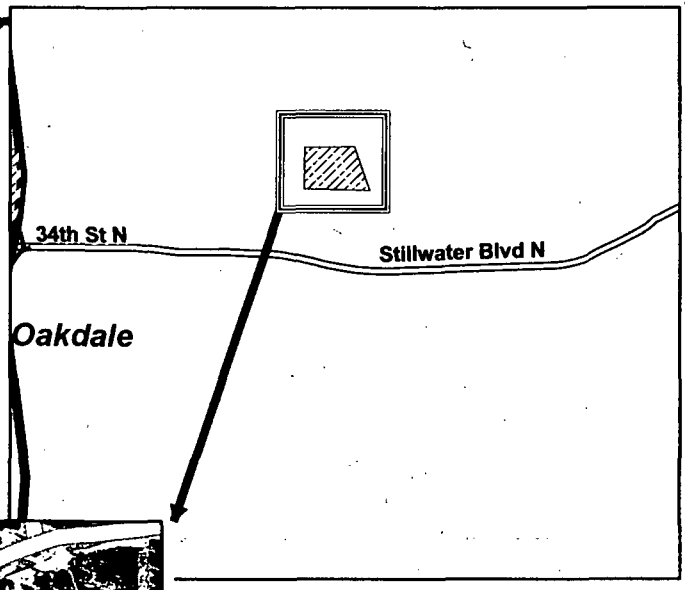
2. MPCA draft guidance document entitled "Air Emissions from Remedial Sites and Landfills," September 1992.

Washington County Landfill Superfund Site
Washington County, Minnnesota

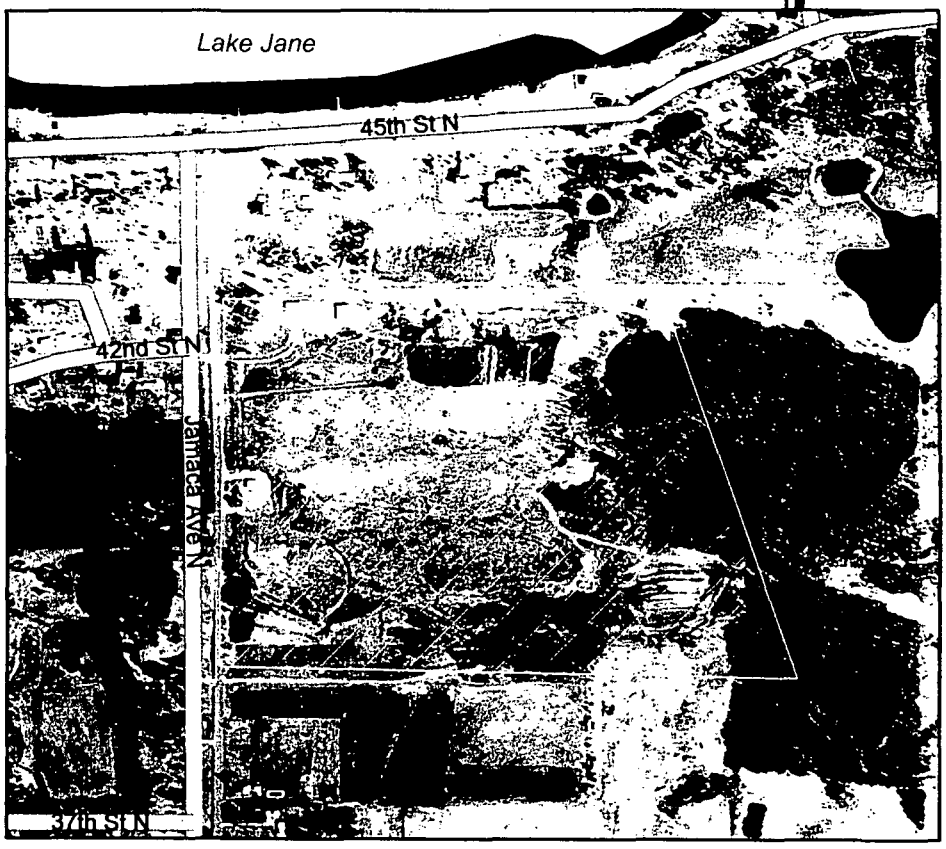
1) State



2) Lake Elmo



3) Washington County Superfund Site



Plot created by David Wilson U.S. EPA Region 6/6/2002

GEOS

Groundwater Evaluation and Optimization System

Figure 1

Table 5 Ground water elevations, 2001-2002

COMMON STATION ID	DATE COLLECTED	PARAMETER NAME	RESULT	TIME COLLECTED
A	04/27/2001	Elevation	897.05	
A	04/27/2001	DTW	51.34	
A	07/24/2001	Elevation	898.27	11:03:00 AM
A	07/24/2001	DTW	50.12	11:03:00 AM
A	10/18/2001	Elevation	898.67	2:28:00 PM
A	10/18/2001	DTW	49.72	2:28:00 PM
A	04/25/2002	DTW	50.75	11:16:00 AM
A	07/30/2002	Elevation	898.22	
AA	04/27/2001	Elevation	895.67	
AA	04/27/2001	DTW	47.25	
AA	10/19/2001	Elevation	901.23	
AA	10/19/2001	DTW	41.69	
B	04/27/2001	Elevation	936.62	
B	04/27/2001	DTW	20.35	
B	10/19/2001	Elevation	936.76	
B	10/19/2001	DTW	20.21	
B	04/24/2002	DTW	20.82	
B	07/30/2002	Elevation	937.61	
BB2	07/24/2001	Elevation	897.36	
BB2	07/24/2001	DTW	30.4	
BB2	10/19/2001	Elevation	893.29	
BB2	10/19/2001	DTW	34.47	
BB2	04/24/2002	Elevation	895.88	
BB2	04/24/2002	DTW	31.88	
BB2	07/30/2002	Elevation	896.86	
BB3	04/27/2001	Elevation	890.76	
BB3	04/27/2001	DTW	37.55	
BB3	07/24/2001	Elevation	897.31	
BB3	07/24/2001	DTW	31	
BB3	10/19/2001	Elevation	890.42	
BB3	10/19/2001	DTW	37.89	
BB3	04/24/2002	Elevation	895.77	
BB3	04/24/2002	DTW	32.54	
BB3	07/30/2002	Elevation	896.82	
C	04/27/2001	Elevation	897.68	
C	04/27/2001	DTW	56.21	
C	07/24/2001	Elevation	898.94	
C	07/24/2001	DTW	54.95	
C	10/19/2001	Elevation	917.88	
C	10/19/2001	DTW	36.01	
C	04/26/2002	DTW	55.37	1:11:00 PM
C	07/30/2002	Elevation	898.87	
D	04/27/2001	Elevation	902	
D	07/24/2001	Elevation	903.3	

Table 5 Ground water elevations, 2001-2002

COMMON STATION ID	DATE COLLECTED	PARAMETER NAME	RESULT	TIME COLLECTED
D	07/24/2001	DTW	51.05	
D	10/19/2001	Elevation	903.8	
D	10/19/2001	DTW	50.55	
D	04/24/2002	DTW	51.82	
D	07/30/2002	Elevation	904.01	
D1	04/27/2001	Elevation	902.78	
D1	04/27/2001	DTW	51.25	
D1	07/24/2001	Elevation	904.24	9:59:00 AM
D1	07/24/2001	DTW	49.79	9:59:00 AM
D1	10/18/2001	Elevation	904.59	1:39:00 PM
D1	10/18/2001	DTW	49.44	1:39:00 PM
D1	04/25/2002	Elevation	903.33	1:41:00 PM
D1	04/25/2002	DTW	50.7	1:41:00 PM
D1	07/30/2002	Elevation	904.09	
DD	04/27/2001	Elevation	895.42	
DD	04/27/2001	DTW	23.85	
DD	07/24/2001	Elevation	896.46	
DD	07/24/2001	DTW	22.81	
DD	10/19/2001	Elevation	895.02	
DD	10/19/2001	DTW	24.25	
DD	04/24/2002	Elevation	894.9	
DD	04/24/2002	DTW	24.37	
DD	07/30/2002	Elevation	895.94	
E	04/27/2001	Elevation	897.35	
E	04/27/2001	DTW	52.08	
E	07/24/2001	Elevation	898.02	
E	07/24/2001	DTW	51.41	
E	10/18/2001	Elevation	899	10:31:00 AM
E	10/18/2001	DTW	50.43	10:31:00 AM
E	04/24/2002	DTW	51.51	2:54:00 PM
E	07/30/2002	Elevation	898.52	
EE	04/30/2001	Elevation	898.88	
EE	04/30/2001	DTW	45.22	
EE	07/23/2001	Elevation	899.58	2:44:00 PM
EE	07/23/2001	DTW	44.52	2:44:00 PM
EE	10/18/2001	Elevation	903.96	1:25:00 PM
EE	10/18/2001	DTW	44.49	1:25:00 PM

Table 5 Ground water elevations, 2001-2002

COMMON STATION ID	DATE COLLECTED	PARAMETER NAME	RESULT	TIME COLLECTED
EE	04/25/2002	Elevation	898.22	2:26:00 PM
EE	04/25/2002	DTW	45.88	2:26:00 PM
EE	07/30/2002	Elevation	899.17	
I	04/30/2001	Elevation	897.95	
I	04/30/2001	DTW	58.55	
I	07/24/2001	Elevation	898.7	12:40:00 PM
I	07/24/2001	DTW	57.8	12:40:00 PM
I	10/18/2001	Elevation	899.22	12:15:00 PM
I	10/18/2001	DTW	57.28	12:15:00 PM
I	04/25/2002	Elevation	898.27	12:45:00 PM
I	04/25/2002	DTW	58.23	12:45:00 PM
I	07/30/2002	Elevation	898.8	
J	04/30/2001	Elevation	799.54	
J	04/30/2001	DTW	57.91	
J	07/24/2001	Elevation	800.3	12:13:00 PM
J	07/24/2001	DTW	57.15	12:13:00 PM
J	10/19/2001	Elevation	800.16	
J	10/19/2001	DTW	57.29	
J	04/24/2002	Elevation	799.9	
J	04/24/2002	DTW	57.55	
J	07/30/2002	Elevation	800.34	
K	04/27/2001	Elevation	901	
K	04/27/2001	DTW	89.5	
K	07/24/2001	Elevation	901	
K	07/24/2001	DTW	89.5	
K	10/19/2001	Elevation	900.96	
K	10/19/2001	DTW	89.54	
K	04/24/2002	Elevation	900.27	
K	04/24/2002	DTW	90.23	
K	07/30/2002	Elevation	900.76	
L	04/30/2001	Elevation	898.69	
L	04/30/2001	DTW	47.71	
L	07/24/2001	Elevation	899.39	11:33:00 AM
L	07/24/2001	DTW	47.01	11:33:00 AM
L	10/18/2001	Elevation	898.93	12:40:00 PM
L	10/18/2001	DTW	47.47	12:40:00 PM

Table 5 Ground water elevations, 2001-2002

COMMON STATION ID	DATE COLLECTED	PARAMETER NAME	RESULT	TIME COLLECTED
L	04/25/2002	Elevation	898.65	12:04:00 PM
L	04/25/2002	DTW	47.75	12:04:00 PM
L	07/30/2002	Elevation	899.36	
M	04/27/2001	Elevation	897.35	
M	04/27/2001	DTW	61.85	
M	07/24/2001	Elevation	898.42	
M	07/24/2001	DTW	60.78	
M	10/19/2001	Elevation	898.76	
M	10/19/2001	DTW	60.44	
M	04/25/2002	Elevation	897.47	10:06:00 AM
M	04/25/2002	DTW	61.73	10:06:00 AM
M	07/30/2002	Elevation	898.73	
P1	04/27/2001	Elevation	920.54	
P1	04/27/2001	DTW	34.02	
P1	07/24/2001	Elevation	921.35	
P1	07/24/2001	DTW	33.21	
P1	04/24/2002	DTW	34.65	
P1	07/30/2002	Elevation	919.95	
P2	04/27/2001	Elevation	893.88	
P2	04/27/2001	DTW	60.1	
P2	07/24/2001	Elevation	898.63	
P2	07/24/2001	DTW	55.35	
P2	10/19/2001	Elevation	898.88	
P2	10/19/2001	DTW	55.1	
P2	07/30/2002	Elevation	897.39	
P3	04/27/2001	Elevation	898.46	
P3	04/27/2001	DTW	36.97	
P3	07/24/2001	Elevation	899.01	
P3	07/24/2001	DTW	36.42	
P3	10/19/2001	Elevation	899.3	
P3	10/19/2001	DTW	36.13	
P3	04/24/2002	DTW	37.16	
P3	07/30/2002	Elevation	898.93	
Q1	04/30/2001	Elevation	898.48	
Q1	04/30/2001	DTW	34.82	
Q1	07/23/2001	Elevation	898.89	4:17:00 PM
Q1	07/23/2001	DTW	34.41	4:17:00 PM
Q1	10/18/2001	Elevation	899.34	3:29:00 PM
Q1	10/18/2001	DTW	33.96	3:29:00 PM
Q1	04/25/2002	Elevation	897.66	4:17:00 PM

Table 5 Ground water elevations, 2001-2002

COMMON STATION ID	DATE COLLECTED	PARAMETER NAME	RESULT	TIME COLLECTED
Q1	04/25/2002	DTW	35.64	4:17:00 PM
Q1	07/30/2002	Elevation	898.61	
Q2	04/30/2001	Elevation	898.55	
Q2	04/30/2001	DTW	35.75	
Q2	07/23/2001	Elevation	899.1	3:40:00 PM
Q2	07/23/2001	DTW	35.2	3:40:00 PM
Q2	10/18/2001	Elevation	899.36	2:55:00 PM
Q2	10/18/2001	DTW	34.94	2:55:00 PM
Q2	04/25/2002	Elevation	897.96	3:46:00 PM
Q2	04/25/2002	DTW	36.34	3:46:00 PM
Q2	07/30/2002	Elevation	898.85	
Q3	04/30/2001	Elevation	898.35	
Q3	04/30/2001	DTW	36.85	
Q3	07/23/2001	Elevation	899.1	3:35:00 PM
Q3	07/23/2001	DTW	36.1	3:35:00 PM
Q3	10/18/2001	Elevation	899.29	2:20:00 PM
Q3	10/18/2001	DTW	35.91	2:20:00 PM
Q3	04/25/2002	Elevation	898.09	3:11:00 PM
Q3	04/25/2002	DTW	37.11	3:11:00 PM
Q3	07/30/2002	Elevation	898.89	
R1	04/27/2001	Elevation	897.98	
R1	04/27/2001	DTW	63.12	
R1	07/23/2001	Elevation	899.15	1:58:00 PM
R1	07/23/2001	DTW	61.95	1:58:00 PM
R1	10/18/2001	Elevation	899.34	12:35:00 PM
R1	10/18/2001	DTW	61.76	12:35:00 PM
R1	04/24/2002	Elevation	898.23	3:28:00 PM
R1	04/24/2002	DTW	62.87	3:28:00 PM
R1	07/30/2002	Elevation	898.86	
R2	04/27/2001	Elevation	897.85	
R2	04/27/2001	DTW	62.55	

Table 5 Ground water elevations, 2001-2002

COMMON STATION ID	DATE COLLECTED	PARAMETER NAME	RESULT	TIME COLLECTED
R2	07/23/2001	Elevation	899	1:27:00 PM
R2	07/23/2001	DTW	61.4	1:27:00 PM
R2	10/18/2001	Elevation	899.25	12:07:00 PM
R2	10/18/2001	DTW	61.15	12:07:00 PM
R2	04/24/2002	Elevation	898.08	3:58:00 PM
R2	04/24/2002	DTW	62.32	3:58:00 PM
R2	07/30/2002	Elevation	898.71	
R3	04/27/2001	Elevation	897.77	
R3	04/27/2001	DTW	61.83	
R3	07/23/2001	Elevation	898.93	1:28:00 PM
R3	07/23/2001	DTW	60.67	1:28:00 PM
R3	10/18/2001	Elevation	899.2	11:30:00 AM
R3	10/18/2001	DTW	60.4	11:30:00 AM
R3	04/24/2002	Elevation	897.97	4:33:00 PM
R3	04/24/2002	DTW	61.63	4:33:00 PM
R3	07/30/2002	Elevation	898.64	
T	04/27/2001	Elevation	897.65	
T	04/27/2001	DTW	34.65	
T	07/24/2001	Elevation	896.81	
T	07/24/2001	DTW	35.49	
T	10/19/2001	Elevation	897.16	
T	10/19/2001	DTW	35.14	
T	04/24/2002	Elevation	895.86	
T	04/24/2002	DTW	36.44	
T	07/30/2002	Elevation	896.85	
U	04/27/2001	Elevation	896.09	
U	04/27/2001	DTW	36.71	
U	07/24/2001	Elevation	897.09	
U	07/24/2001	DTW	35.71	
U	10/19/2001	Elevation	895.59	
U	10/19/2001	DTW	37.21	
U	04/24/2002	Elevation	895.65	
U	04/24/2002	DTW	37.15	
U	07/30/2002	Elevation	896.78	
V	04/30/2001	Elevation	897.99	
V	04/30/2001	DTW	50.31	
V	07/24/2001	Elevation	898.51	1:17:00 PM

Table 5 Ground water elevations, 2001-2002

COMMON STATION ID	DATE COLLECTED	PARAMETER NAME	RESULT	TIME COLLECTED
V	07/24/2001	DTW	49.79	1:17:00 PM
V	10/18/2001	Elevation	898.93	3:30:00 PM
V	10/18/2001	DTW	49.37	3:30:00 PM
V	04/25/2002	Elevation	897.65	9:18:00 AM
V	04/25/2002	DTW	50.65	9:18:00 AM
V	07/30/2002	Elevation	898.35	
V2	04/30/2001	Elevation	897.17	
V2	04/30/2001	DTW	51.73	
V2	07/24/2001	Elevation	898.25	1:21:00 PM
V2	07/24/2001	DTW	50.65	1:21:00 PM
V2	10/18/2001	Elevation	898.65	3:26:00 PM
V2	10/18/2001	DTW	50.25	3:26:00 PM
V2	04/24/2002	Elevation	897.36	5:08:00 PM
V2	04/24/2002	DTW	51.54	5:08:00 PM
V2	07/30/2002	Elevation	898.02	
Z	04/27/2001	Elevation	896.55	
Z	04/27/2001	DTW	51.85	
Z	07/24/2001	Elevation	897.79	
Z	07/24/2001	DTW	50.61	
Z	10/19/2001	Elevation	888.23	
Z	10/19/2001	DTW	60.17	
A	07/30/2002	DTW	50.17	
A	07/30/2002	DTW	50.17	
B	07/30/2002	DTW	19.36	
BB2	07/30/2002	DTW	30.9	
BB3	07/30/2002	DTW	31.49	
C	07/30/2002	DTW	55.02	
D	07/30/2002	DTW	50.34	
D1	07/30/2002	DTW	49.94	
D1	07/30/2002	DTW	49.94	
DD	07/30/2002	DTW	23.33	
E	07/30/2002	DTW	50.91	
E	07/30/2002	DTW	50.91	
EE	07/30/2002	DTW	44.93	
EE	07/30/2002	DTW	44.93	
I	07/30/2002	DTW	57.7	
I	07/30/2002	DTW	57.7	
J	07/30/2002	DTW	57.11	
K	07/30/2002	DTW	89.74	

Table 5 Ground water elevations, 2001-2002

COMMON STATION ID	DATE COLLECTED	PARAMETER NAME	RESULT	TIME COLLECTED
L	07/30/2002	DTW	47.04	
L	07/30/2002	DTW	47.04	
M	07/30/2002	DTW	60.47	
P1	07/30/2002	DTW	34.61	
P2	07/30/2002	DTW	56.59	
P3	07/30/2002	DTW	36.5	
Q1	07/30/2002	DTW	34.69	
Q1	07/30/2002	DTW	34.69	
Q2	07/30/2002	DTW	35.45	
Q2	07/30/2002	DTW	35.45	
Q3	07/30/2002	DTW	36.31	
Q3	07/30/2002	DTW	36.31	
R1	07/30/2002	DTW	62.24	
R1	07/30/2002	DTW	62.24	
R2	07/30/2002	DTW	61.69	
R2	07/30/2002	DTW	61.69	
R3	07/30/2002	DTW	60.96	
R3	07/30/2002	DTW	60.96	
T	07/30/2002	DTW	35.45	
U	07/30/2002	DTW	36.02	
V	07/30/2002	DTW	49.95	
V	07/30/2002	DTW	49.95	
V2	07/30/2002	DTW	50.88	
V2	07/30/2002	DTW	50.85	
A	11/21/2002	Elevation	899.26	
AA	11/21/2002	Elevation	900.81	
B	11/21/2002	Elevation	938.02	
BB2	11/21/2002	Elevation	897.96	
BB3	11/21/2002	Elevation	897.84	
C	11/21/2002	Elevation	899.78	
D	11/21/2002	Elevation	901.36	
D1	11/21/2002	Elevation	904.45	
E	11/21/2002	Elevation	899.32	
EE	11/21/2002	Elevation	900.25	
GC2R	11/21/2002	Elevation	892.82	
GC4	11/21/2002	Elevation	893.89	
I	11/21/2002	Elevation	899.75	
J	11/21/2002	Elevation	801.24	
L	11/21/2002	Elevation	900.19	
M	11/21/2002	Elevation	899.3	
P1	11/21/2002	Elevation	921.56	
P2	11/21/2002	Elevation	899.31	
P3	11/21/2002	Elevation	900.12	
Q1	11/21/2002	Elevation	899.67	
Q2	11/21/2002	Elevation	900.88	
Q3	11/21/2002	Elevation	899.88	
R1	11/21/2002	Elevation	899.85	
R2	11/21/2002	Elevation	899.69	
R3	11/21/2002	Elevation	899.63	

Table 5 Ground water elevations, 2001-2002

COMMON STATION ID	DATE COLLECTED	PARAMETER NAME	RESULT	TIME COLLECTED
T	11/21/2002	Elevation	898.1	
U	11/21/2002	Elevation	897.29	
V	11/21/2002	Elevation	899.33	
V2	11/21/2002	Elevation	899.03	
Z	11/21/2002	Elevation	898.45	
A	11/21/2002	DTW	49.13	
AA	11/21/2002	DTW	42.11	
B	11/21/2002	DTW	18.95	
BB2	11/21/2002	DTW	29.8	
BB3	11/21/2002	DTW	30.47	
C	11/21/2002	DTW	54.11	
D	11/21/2002	DTW	52.99	
D1	11/21/2002	DTW	49.58	
DD	11/21/2002	DTW	26.51	
E	11/21/2002	DTW	50.11	
EE	11/21/2002	DTW	43.85	
GC2R	11/21/2002	DTW	61.68	
GC4	11/21/2002	DTW	50.11	
I	11/21/2002	DTW	56.75	
J	11/21/2002	DTW	56.21	
L	11/21/2002	DTW	46.21	
M	11/21/2002	DTW	59.9	
P1	11/21/2002	DTW	33	
P2	11/21/2002	DTW	54.67	
P3	11/21/2002	DTW	35.31	
Q1	11/21/2002	DTW	33.63	
Q2	11/21/2002	DTW	33.42	
Q3	11/21/2002	DTW	35.32	
R1	11/21/2002	DTW	61.25	
R2	11/21/2002	DTW	60.71	
R3	11/21/2002	DTW	59.97	
T	11/21/2002	DTW	34.2	
U	11/21/2002	DTW	35.51	
V	11/21/2002	DTW	48.97	
V2	11/21/2002	DTW	49.87	
Z	11/21/2002	DTW	49.95	

Table 6 Total VOCs 2001-2002

START DATE	A	D	D1	E	EE	Field Blank 1	GC1	I	L	Q1	Q2	Q3	R1	R2	R3	TA-1	Trip Blank 1	V	V2	Z
4/27/2001	0.50	70.20	10.50	5.00	34.00	12.00		191.30	1.30	0.80	1.20	0.60	3.20	3.40	6.70	51.80		11.50	238.00	
6/1/2001																	76.00			
7/23/2001	0.60		11.90		26.70		10.10	92.10	0.90	0.50	1.10		2.90	3.40	5.30	16.80	43.00	19.80	214.10	
10/18/2001	0.20		28.00	8.00	96.20			222.20	3.40	0.40	2.20	2.00	7.20	12.80	19.60		84.00	71.80	481.80	
12/28/2001							16.00									11.60	200.00			
4/24/2002			6.10		21.10		19.50	126.30	2.70	0.10	0.50	0.60	3.20	2.80	7.60	22.40	110.00	23.40	153.50	
7/30/2002	0.10		8.00		22.50		27.70	117.80	1.30	0.10	0.70	0.80	3.10	3.60	7.00	6.50		20.10	165.40	
11/21/2002	0.10		6.50	2.80	27.30		23.80	96.20	1.00	0.10	0.60		2.70	3.70	6.00	22.50	100.00	18.30	151.20	4.40

VERTICAL GRADIENT REPORT

STATION	LIQUID ELEVATION	MEASURING POINT ELEVATION	DEPTH TO SCREEN TOP	DEPTH TO SCREEN BOTTOM	SCREEN MIDPOINT	GRADIENT	Date
R1	897.98	960.27	78.50	82.50	879.77		
						0.0051	04/27/2001
R2	897.85	959.68	103.50	107.50	854.18		
						0.0047	04/27/2001
R3	897.77	958.91	117.50	126.00	837.16		
Q1	898.48	932.49	63.50	67.50	866.99		
						-0.0037	04/30/2001
Q2	898.55	933.38	83.50	87.50	847.88		
						0.0060	04/30/2001
Q3	898.35	934.36	113.50	126.00	814.61		
V	897.99	948.00	66.00	74.00	878.00		
						0.0305	04/30/2001
V2	897.17	949.14	93.00	103.00	851.14		
Q1	898.89	932.49	63.50	67.50	866.99		
						-0.0110	07/23/2001
Q2	899.10	933.38	83.50	87.50	847.88		
						0.0000	07/23/2001
Q3	899.10	934.36	113.50	126.00	814.61		
R1	899.15	960.27	78.50	82.50	879.77		
						0.0059	07/23/2001
R2	899.00	959.68	103.50	107.50	854.18		
						0.0041	07/23/2001
R3	898.93	958.91	117.50	126.00	837.16		
BB2	897.36	927.95	72.00	82.00	850.95		
						0.0015	07/24/2001
BB3	897.31	928.50	106.00	118.00	816.50		
V	898.51	948.00	66.00	74.00	878.00		

VERTICAL GRADIENT REPORT

STATION	LIQUID ELEVATION	MEASURING POINT ELEVATION	DEPTH TO SCREEN TOP	DEPTH TO SCREEN BOTTOM	SCREEN MIDPOINT	GRADIENT	Date
V2	898.25	949.14	93.00	103.00	851.14	0.0097	07/24/2001
Q1	899.34	932.49	63.50	67.50	866.99		
Q2	899.36	933.38	83.50	87.50	847.88	-0.0010	10/18/2001
Q3	899.29	934.36	113.50	126.00	814.61	0.0021	10/18/2001
R1	899.34	960.27	78.50	82.50	879.77		
R2	899.25	959.68	103.50	107.50	854.18	0.0035	10/18/2001
R3	899.20	958.91	117.50	126.00	837.16	0.0029	10/18/2001
V	898.93	948.00	66.00	74.00	878.00		
V2	898.65	949.14	93.00	103.00	851.14	0.0104	10/18/2001
BB2	895.88	927.95	72.00	82.00	850.95		
BB3	895.77	928.50	106.00	118.00	816.50	0.0032	04/24/2002
R1	898.23	960.27	78.50	82.50	879.77		
R2	898.08	959.68	103.50	107.50	854.18	0.0059	04/24/2002
R3	897.97	958.91	117.50	126.00	837.16	0.0065	04/24/2002
V	897.65	948.00	66.00	74.00	878.00		
V2	897.36	949.14	93.00	103.00	851.14	0.0108	04/24/2002

VERTICAL GRADIENT REPORT

STATION	LIQUID ELEVATION	MEASURING POINT ELEVATION	DEPTH TO SCREEN TOP	DEPTH TO SCREEN BOTTOM	SCREEN MIDPOINT	GRADIENT	Date
BB2	896.86	927.95	72.00	82.00	850.95		
						0.0012	07/30/2002
BB3	896.82	928.50	106.00	118.00	816.50		
Q1	898.61	932.49	63.50	67.50	866.99		
						-0.0126	07/30/2002
Q2	898.85	933.38	83.50	87.50	847.88		
						-0.0012	07/30/2002
Q3	898.89	934.36	113.50	126.00	814.61		
R1	898.86	960.27	78.50	82.50	879.77		
						0.0059	07/30/2002
R2	898.71	959.68	103.50	107.50	854.18		
						0.0041	07/30/2002
R3	898.64	958.91	117.50	126.00	837.16		
V	898.35	948.00	66.00	74.00	878.00		
						0.0123	07/30/2002
V2	898.02	949.14	93.00	103.00	851.14		
BB2	897.96	927.95	72.00	82.00	850.95		
						0.0035	11/21/2002
BB3	897.84	928.50	106.00	118.00	816.50		
Q1	899.67	932.49	63.50	67.50	866.99		
						-0.0633	11/21/2002
Q2	900.88	933.38	83.50	87.50	847.88		
						0.0301	11/21/2002
Q3	899.88	934.36	113.50	126.00	814.61		
R1	899.85	960.27	78.50	82.50	879.77		
						0.0063	11/21/2002
R2	899.69	959.68	103.50	107.50	854.18		

VERTICAL GRADIENT REPORT

STATION	LIQUID ELEVATION	MEASURING POINT ELEVATION	DEPTH TO SCREEN TOP	DEPTH TO SCREEN BOTTOM	SCREEN MIDPOINT	GRADIENT	Date
						0.0035	11/21/2002
R3	899.63	958.91	117.50	126.00	837.16		
V	899.33	948.00	66.00	74.00	878.00		
						0.0112	11/21/2002
V2	899.03	949.14	93.00	103.00	851.14		

Table 8 Compliance with ARARS in micrograms per liter

Well	Date	Compound	Standard	Amount Found	Average
TA-1	22-Nov-00	Manganese	1000	1100	
TA-1	27-Apr-01	Arsenic	10	26	
E	27-Apr-01	Manganese	1000	1200	
V	28-Apr-00	Vinyl Chloride	0.2	1.8	
V	18-Oct-01	Vinyl Chloride	0.2	0.9	
V	25-Apr-02	Vinyl Chloride	0.2	0.6	
V	30-Jul-02	Vinyl Chloride	0.2	0.7	
V	21-Nov-02	Vinyl Chloride	0.2	0.5	0.9
	28-Apr-00	Benzene	10	24	
	20-Jul-00	Benzene	10	20	
	22-Nov-00	Benzene	10	20	
	30-Apr-01	Benzene	10	17	
	24-Jul-01	Benzene	10	16	
	18-Oct-01	Benzene	10	17	19
	24-Jul-01	Manganese	1000	5100	
	30-Jul-02	Manganese	1000	4200	4650
	28-Apr-00	Vinyl Chloride	0.2	1.4	
R3	23-Jul-01	manganese	1000	1400	
R3	30-Jul-02	manganese	1000	1500	
R3	28-Apr-00	Vinyl Chloride	0.2	0.5	
EE	28-Apr-00	Vinyl Chloride	0.2	6	
EE	20-Jul-00	Vinyl Chloride	0.2	1.6	
EE	22-Nov-00	Vinyl Chloride	0.2	1.7	
EE	30-Apr-01	Vinyl chloride	0.2	0.9	
EE	23-Jul-01	Vinyl chloride	0.2	0.7	
EE	18-Oct-01	Vinyl chloride	0.2	1.4	
EE	30-Jul-02	Vinyl chloride	0.2	0.5	
EE	21-Nov-02	Vinyl chloride	0.2	0.7	1.7

TABLE 9. MONTHLY VOLUME OF GROUND WATER EXTRACTED FROM THE GRADIENT CONTROL WELLS, WASHINGTON COUNTY LANDFILL, YEAR 2000-2002

Month	GC-1 Monthy Volume (gal)	GC-2 Monthy Volume (gal)	GC-3 Monthy Volume (gal)	GC-4 Monthy Volume (gal)	Total Monthly Volume (gal)	GC-1 Average Flow Rate (gpm)	GC-2 Average Flow Rate (gpm)	GC-3 Average Flow Rate (gpm)	GC-4 Average Flow Rate (gpm)	Total Average Flow Rate (gpm)
Jan-00		0	0	891,915	891,915		0.00	0.00	19.98	19.98
Feb-00		0	2,227,792	2,871,425	5,099,218		0.00	53.35	68.76	122.11
Mar-00		0	2,476,170	2,823,343	5,299,513		0.00	55.47	63.25	118.72
Apr-00		0	2,498,895	2,601,906	5,100,801		0.00	57.84	60.23	118.07
May-00		0	223,942	226,511	450,453		0.00	5.02	5.07	10.09
Jun-00		0	0	0	0		0.00	0.00	0.00	0.00
Jul-00		0	0	0	0		0.00	0.00	0.00	0.00
Aug-00		1,573,766	0	2,932,882	4,506,648		35.25	0.00	65.70	100.96
Sep-00		838,934	0	3,077,518	3,916,452		19.42	0.00	71.24	90.66
Oct-00		726,981	0	2,175,798	2,902,779		16.29	0.00	48.74	65.03
Nov-00		1,166,408	0	2,861,635	4,028,043		27.00	0.00	66.24	93.24
Dec-00		1,638,949	0	3,442,609	5,081,558		36.71	0.00	77.12	113.83
Total		5,945,038	7,426,800	23,905,542	37,277,380		26.93	42.92	54.63	
Jan-01	0	1,717,112	0	3,269,278	4,986,390					
Feb-01	0	1,604,000	0	2,848,742	4,452,742					
Mar-01	0	1,058,578	0	3,580,261	4,638,839					
Apr-01	0	1,463,782	0	3,221,374	4,685,156					
May-01	0	214,090	0	130,703	344,793					
Jun-01	1,716,794	0	0	0	1,716,794					
Jul-01	5,215,592	0	0	0	5,215,592					
Aug-01	5,274,146	0	0	0	5,274,146					
Sep-01	5,085,360	0	0	0	5,085,360					
Oct-01	592,379	0	0	0	592,379					
Nov-01	8,263,223	0	0	0	8,263,223					

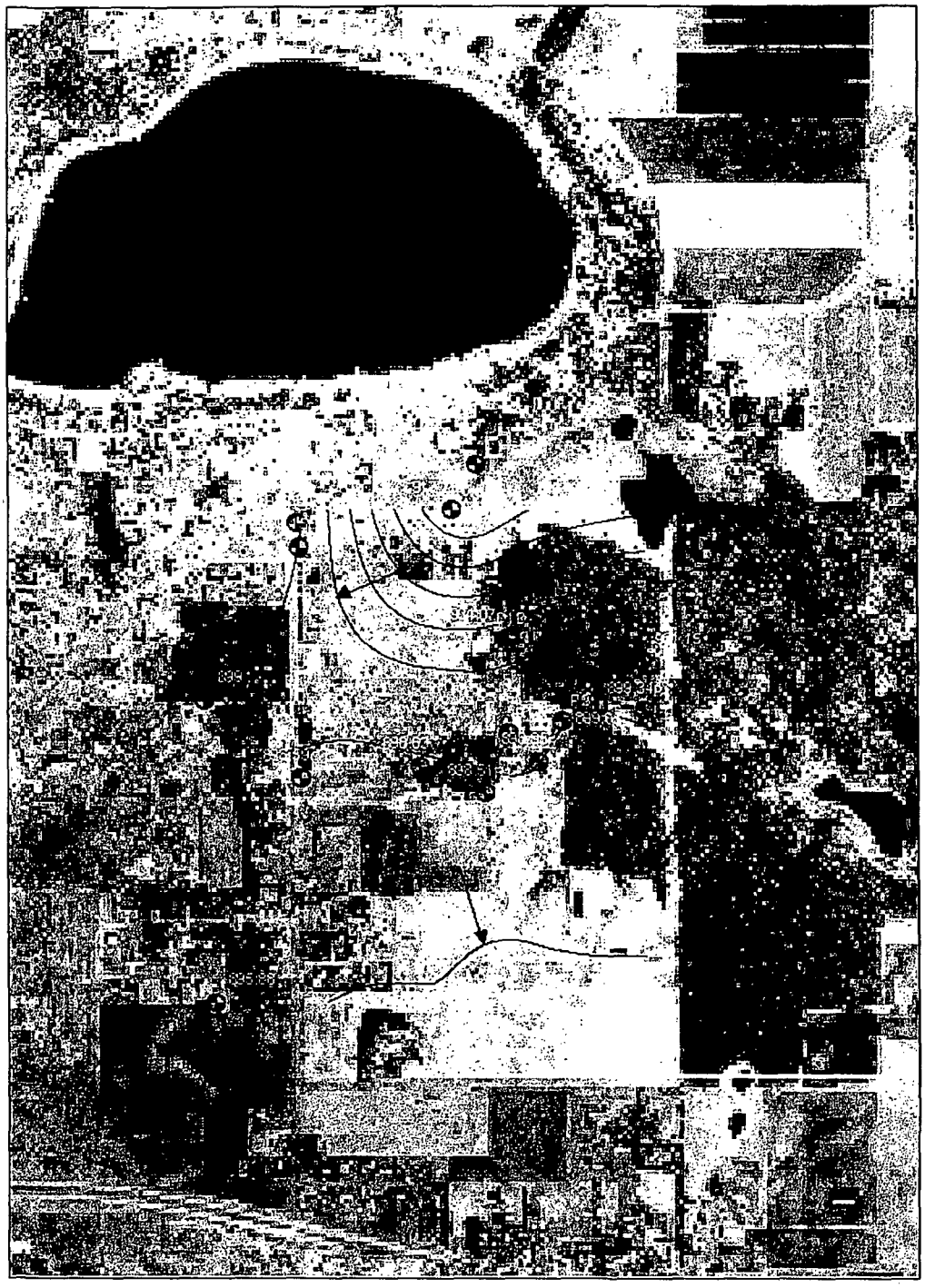
TABLE 9. MONTHLY VOLUME OF GROUND WATER EXTRACTED FROM THE GRADIENT CONTROL WELLS, WASHINGTON COUNTY LANDFILL, YEAR 2000-2002

Month	GC-1 Monthy Volume (gal)	GC-2 Monthy Volume (gal)	GC-3 Monthy Volume (gal)	GC-4 Monthy Volume (gal)	Total Monthly Volume (gal)	GC-1 Average Flow Rate (gpm)	GC-2 Average Flow Rate (gpm)	GC-3 Average Flow Rate (gpm)	GC-4 Average Flow Rate (gpm)	Total Average Flow Rate (gpm)
Dec-01	7,188,395	0	0	0	7,188,395					
Total	33,335,889	6,057,562	0	13,050,358	52,443,809	63	11.50	0.00	24.80	100
Jan-02	7,436,364	0	0	0	7,436,364					
Feb-02	6,862,004	0	0	0	6,862,004					
Mar-02	7,815,318	0	0	0	7,815,318					
Apr-02	7,550,000	0	0	0	7,550,000					
May-02	7,920,000	0	0	0	7,920,000					
Jun-02	4,840,000	0	0	0	4,840,000					
Jul-02	1,531,530	0	0	0	1,531,530					
Aug-02	1,212,080	0	0	0	1,212,080					
Sep-02	8,130,610	0	0	0	8,130,610					
Oct-02	7,248,940	0	0	0	7,248,940					
Nov-02	6,538,110	0	0	0	6,538,110					
Dec-02	2,615,245	0	0	0	2,615,245					
	69,700,201	0	0	0	69,700,201	127.60				

Table 10: Total Pounds of Volatile Organic Compounds removed through the gradient control wells in 1998 through 2002

Well	Date	Total VOCs	Avg. VOCs for the year	Total Pounds of VOCs	
GC2R	5/20/1998	121.6			
GC2R	8/27/1998	185.9			
GC2R	12/10/1998	290.4	199.3	9.9	
GC4	12/10/1998	220.5	73.5	0.6	
GC2r	3/1/1999	138.8			
GC2R	4/1/1999	206.0	172.4	17.1	
GC3	4/1/1999	9.2			
GC3	11/1/1999	21.5	15.4	2.4	
GC4	3/1/1999	81.6			
GC4	4/1/1999	205.3			
GC4	11/1/1999	113.8	133.6	31.5	
GC2R	11/22/2000	121.9	121.9	6.0	
GC4	11/22/2000	107.7	107.7	21.5	
GC1	07/24/2001	10.1			
GC1	12/28/2001	16.0	13.1	0.8	
GC1	04/24/2002	18.4			
GC1	07/30/2002	27.6			
GC1	11/21/2002	23.8	22.2	12.9	11.9
GC2R	04/27/2001	88.6	88.6	4.5	
GC2R	04/24/2002	5.0	5		
GC4	04/27/2001	61.4	61.4	6.7	
GC4	04/24/2002	18.9	18.9		

Figure 3 Flow in the surficial aquifer, October 2001



Oct 2001 Contour WT

Contour Interval is 1 meter

990

Meters

Figure 4 Flow in the surficial aquifer, November 2002

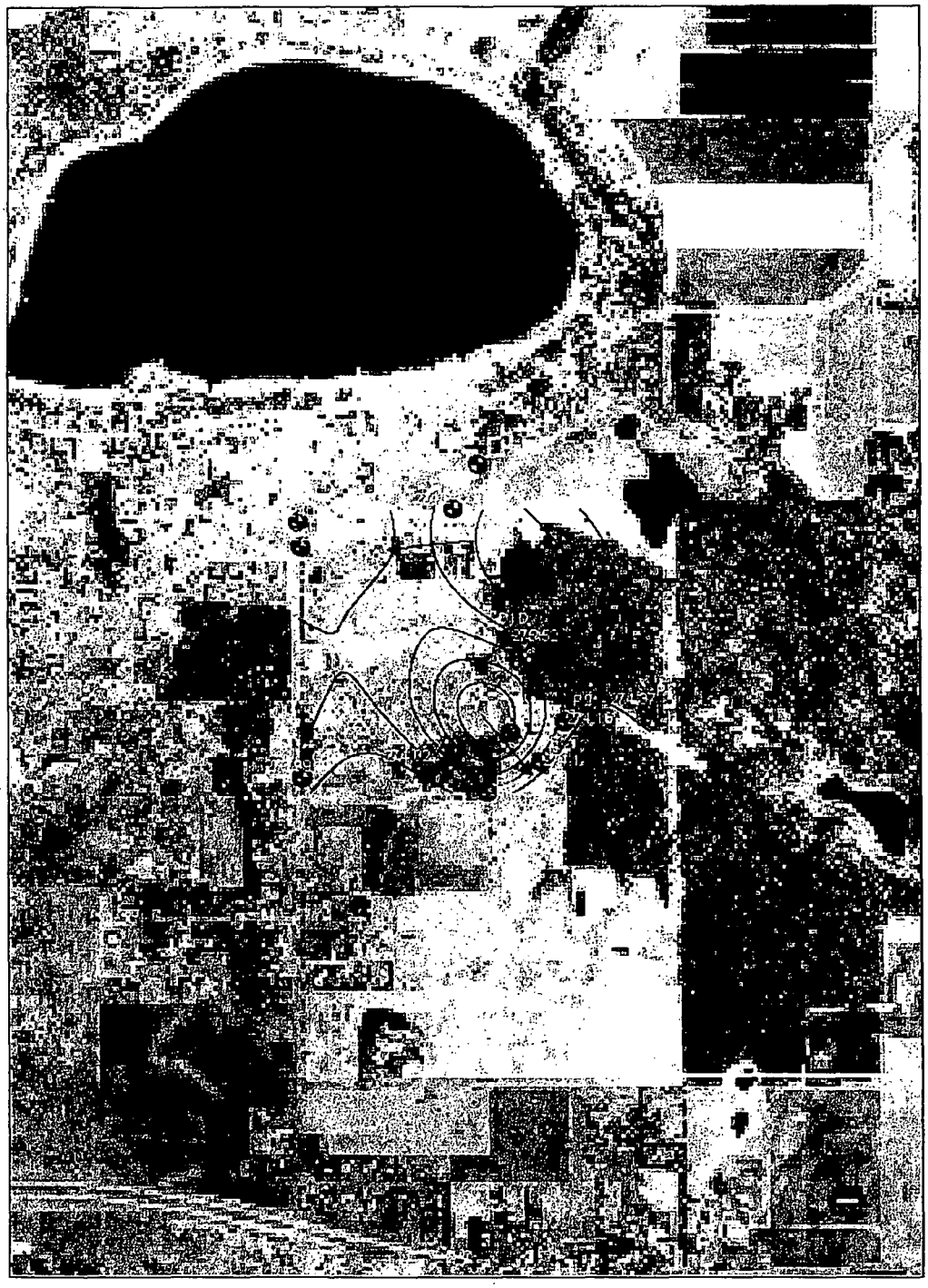


Figure 5 Flow at the base of the surficial aquifer, October 2001

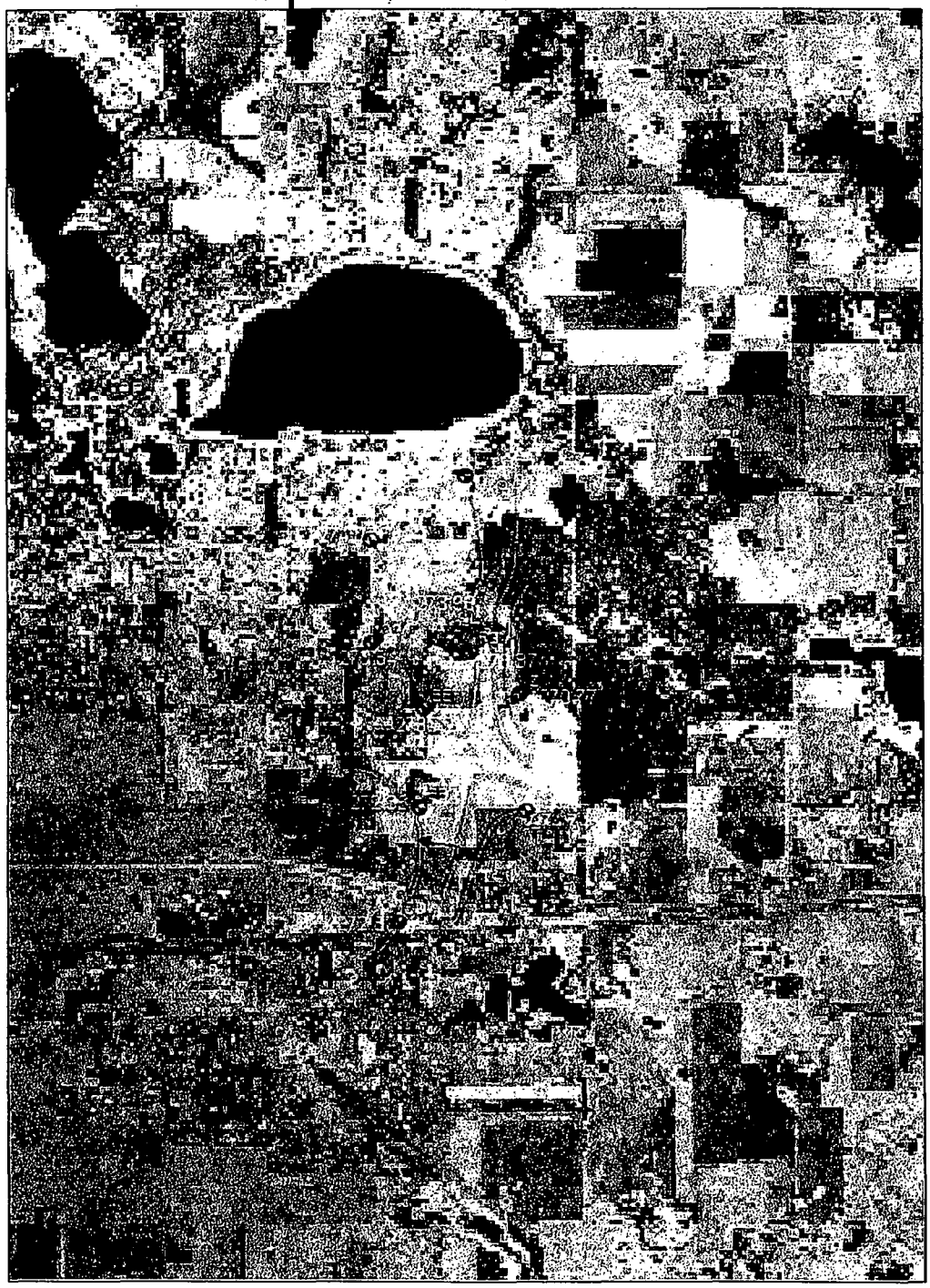


Figure 6 Flow at the base of the surficial aquifer, November 2002

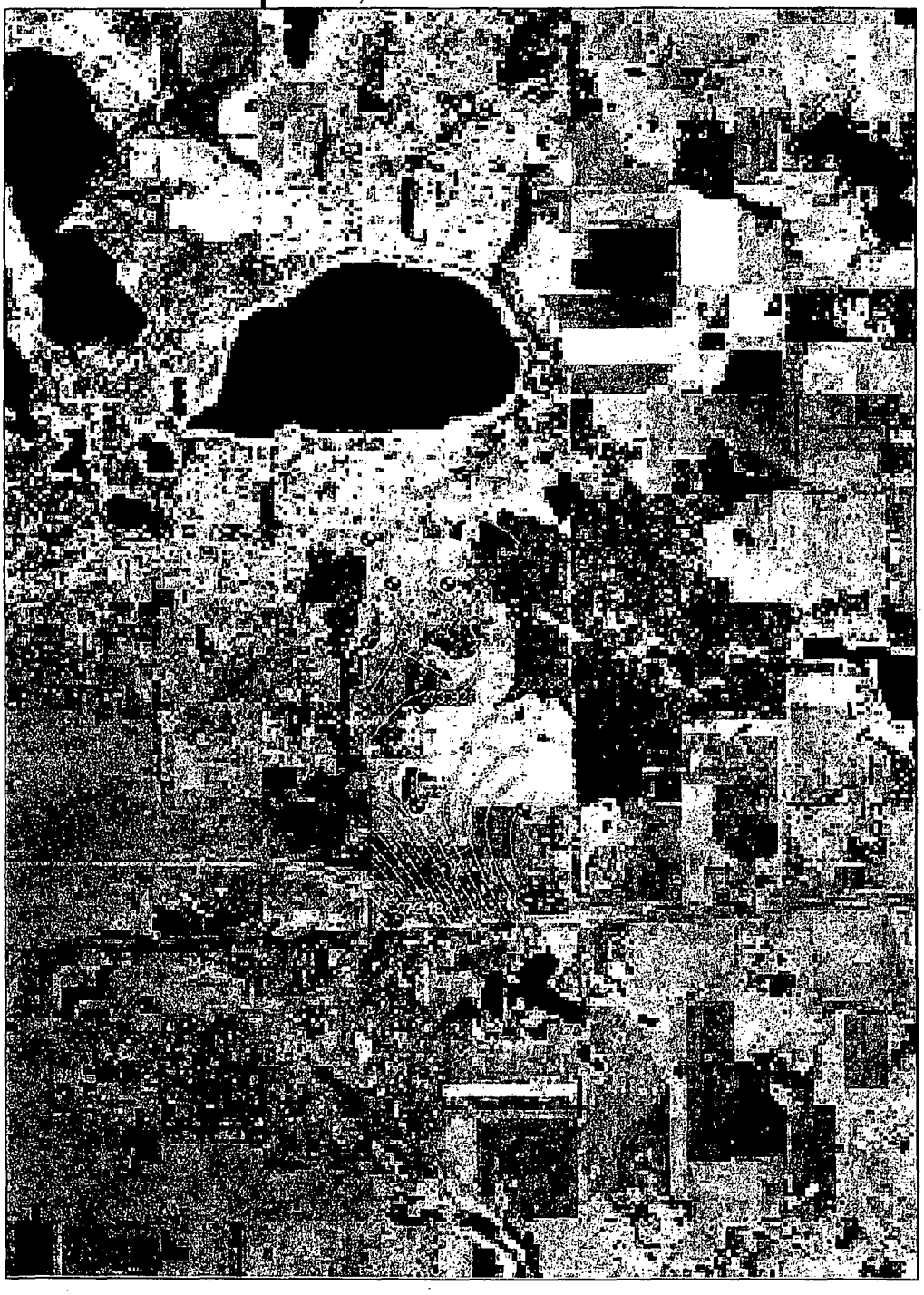


Figure 7 Flow in the Prairie du Chien aquifer, November 2002

Nov 2002 PdC
Contour Interval is 0.05 meters

1,900
Meters

Figure 8. Washington County Sanitary Landfill
VOCs vs. Water Table Elevations - Well D

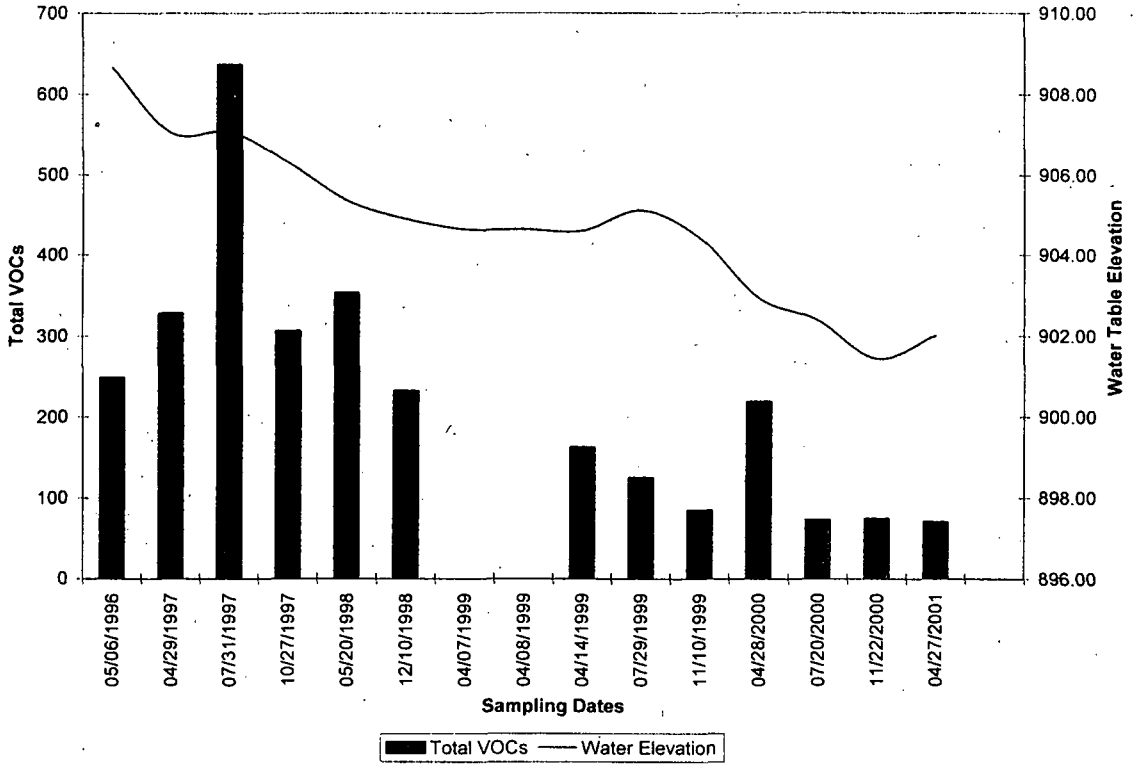


Figure 9. Washington County Sanitary Landfill
VOCs vs. Water Table Elevations - Well D1

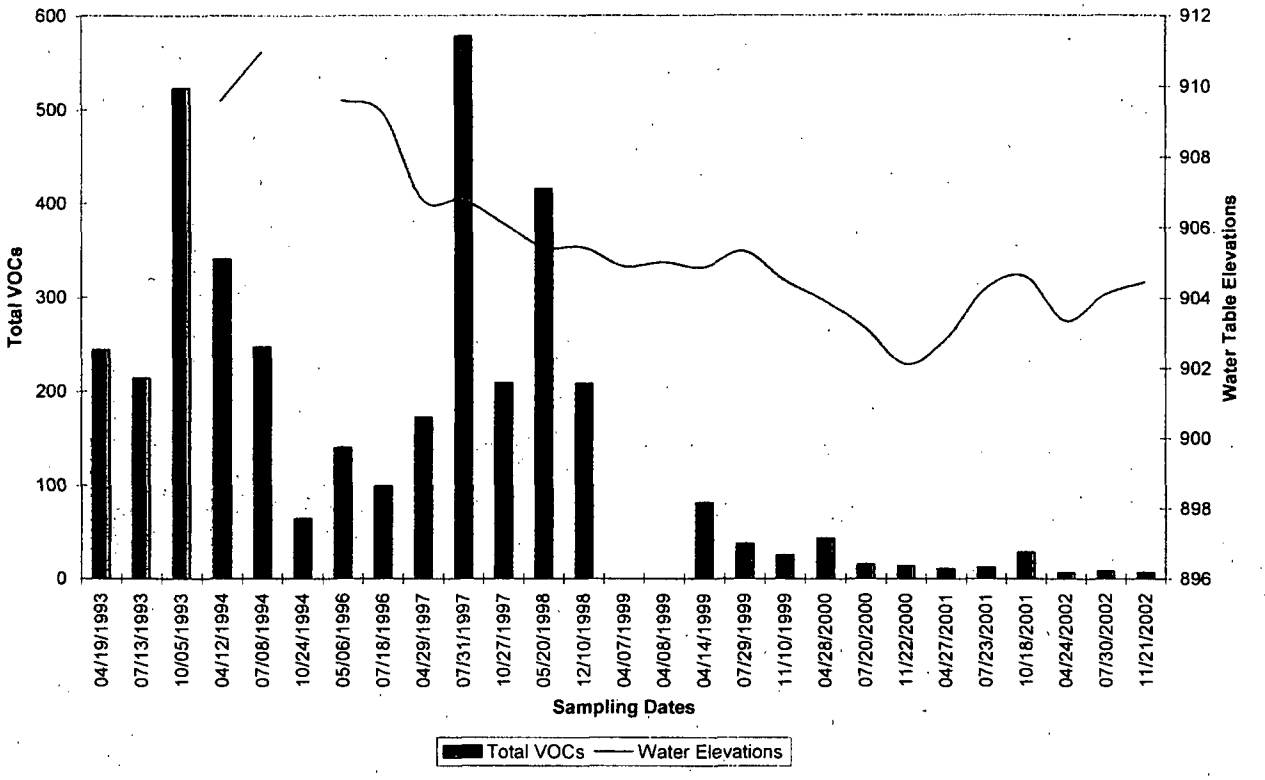


Figure 10. Washington County Sanitary Landfill
VOCs vs. Water Table Elevations - Well EE (Deep)

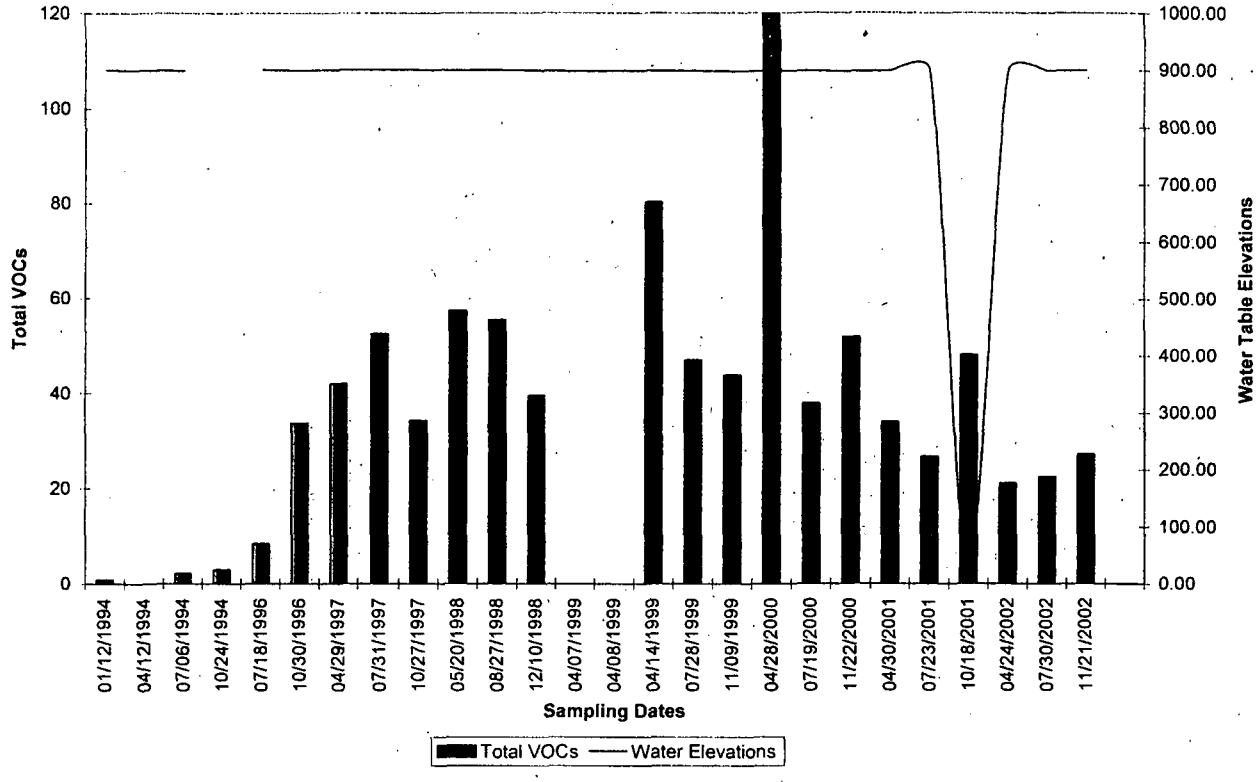


Figure 11. Washington County Sanitary Landfill
VOCs vs. Water Table Elevations - Well GC2R (Gradient Control)

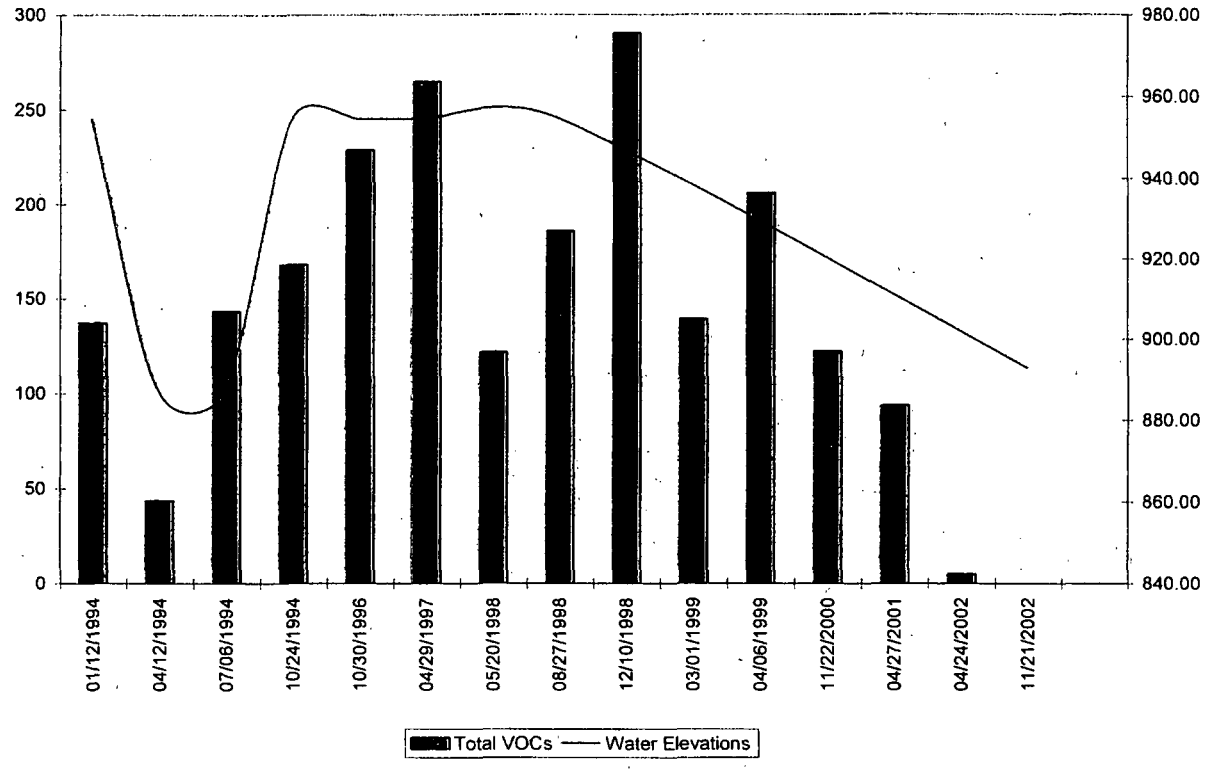


Figure 12. Washington County Sanitary Landfill
VOCs vs. Water Table Elevations - Well GC4 (Gradient Control)

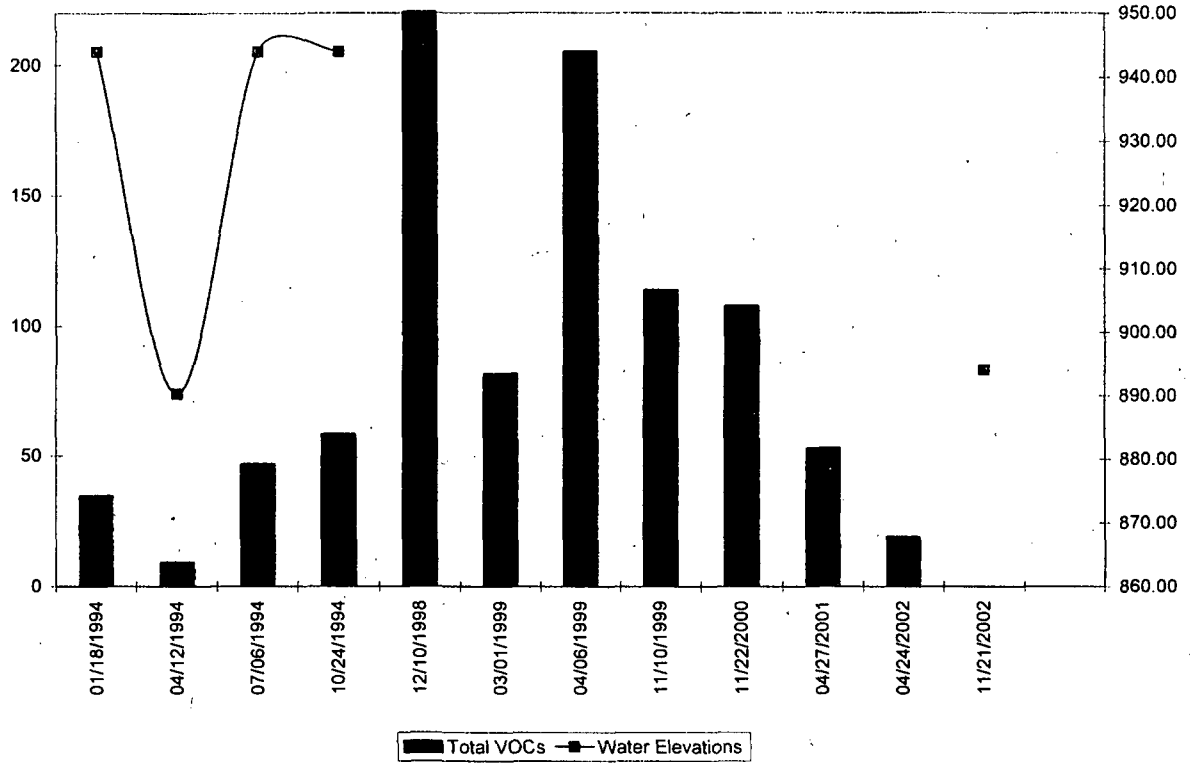


Figure 14. Washington County Sanitary Landfill
VOCs vs. Water Table Elevations - Well I

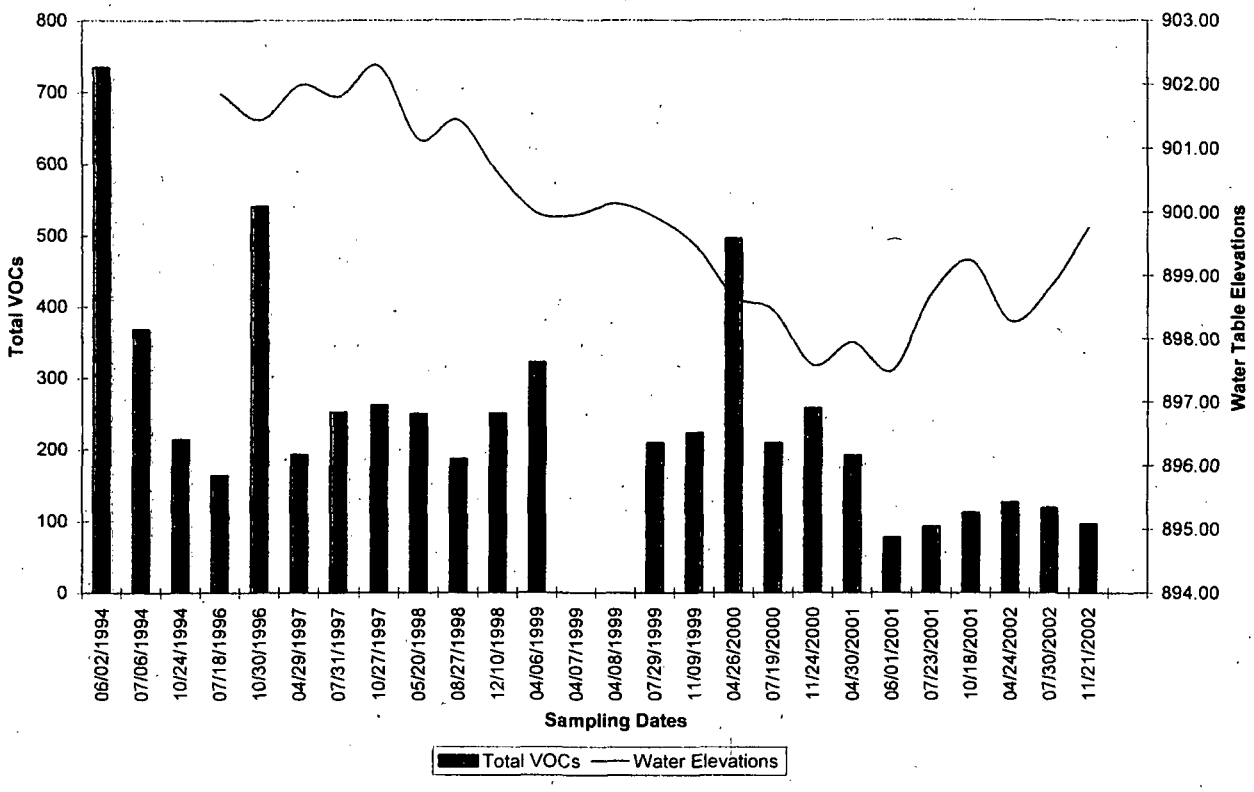


Figure 15. Washington County Sanitary Landfill
VOCs vs. Water Table Elevations - Well Q1

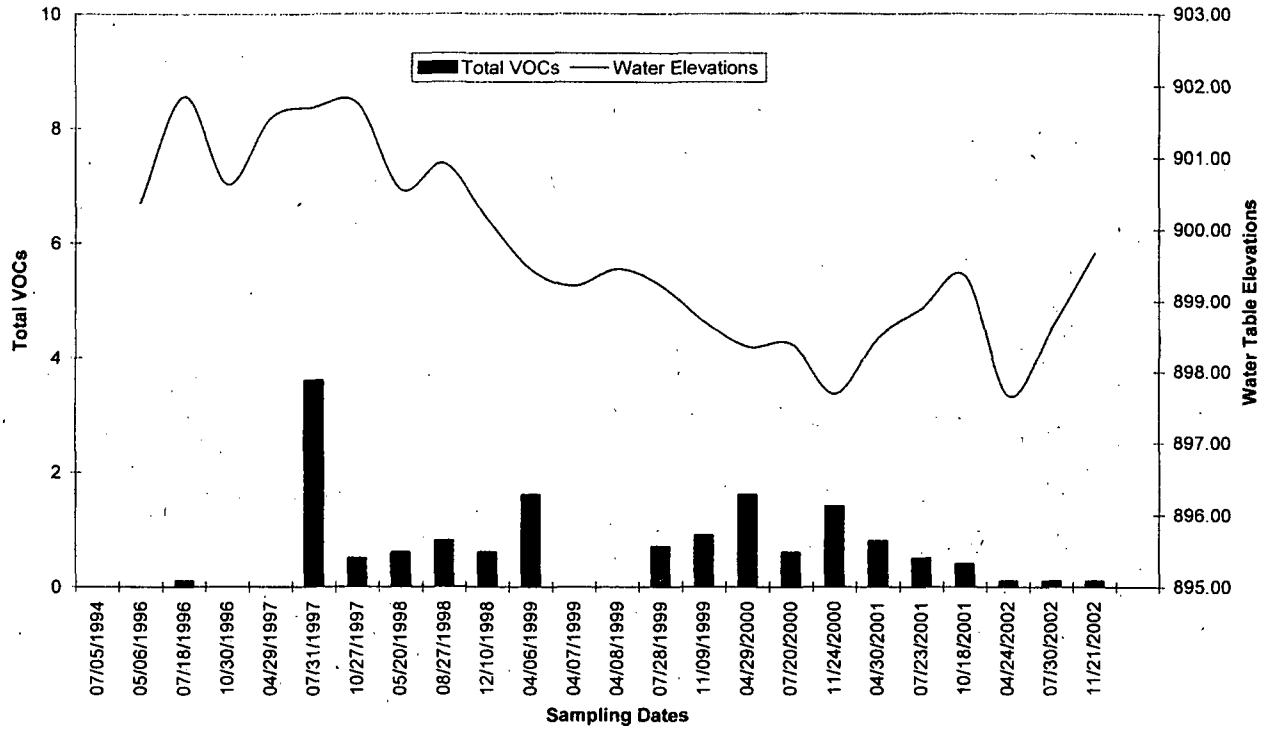


Figure 16. Washington County Sanitary Landfill
VOCs vs. Water Table Elevations - Well Q2

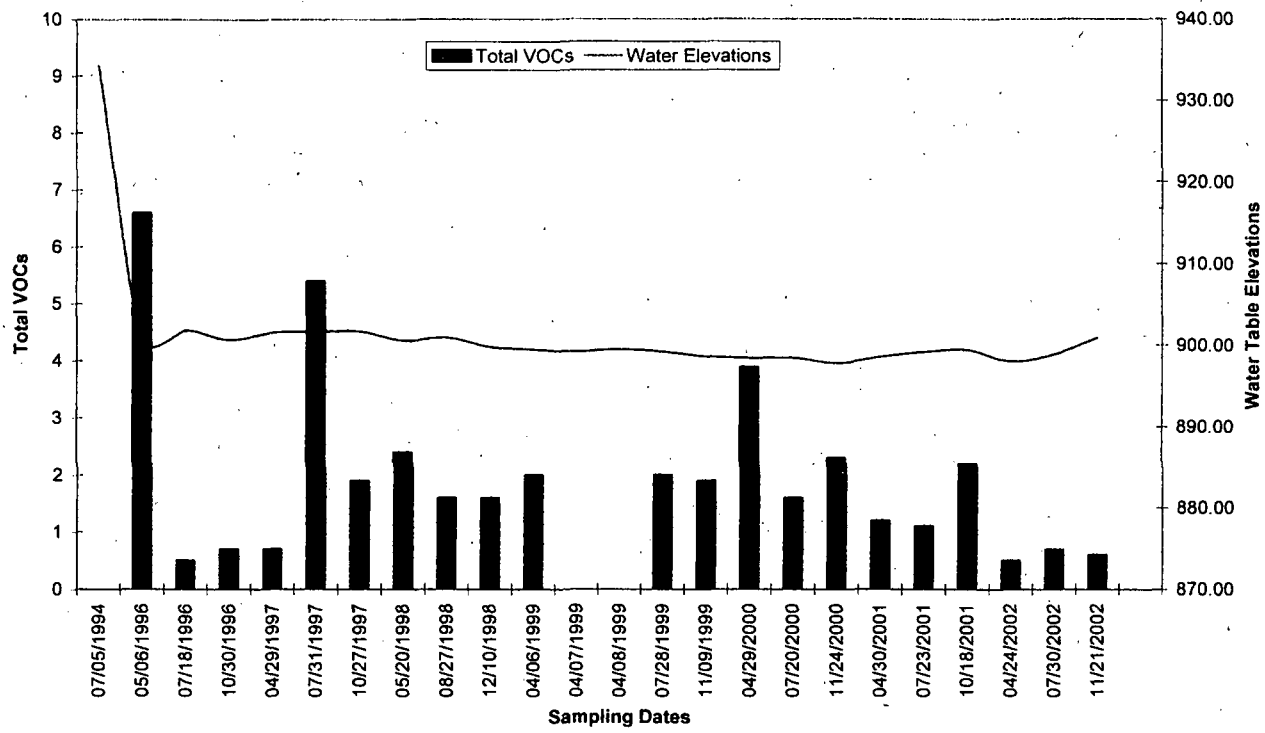


Figure 17. Washington County Sanitary Landfill
VOCs vs. Water Table Elevations - Well Q3

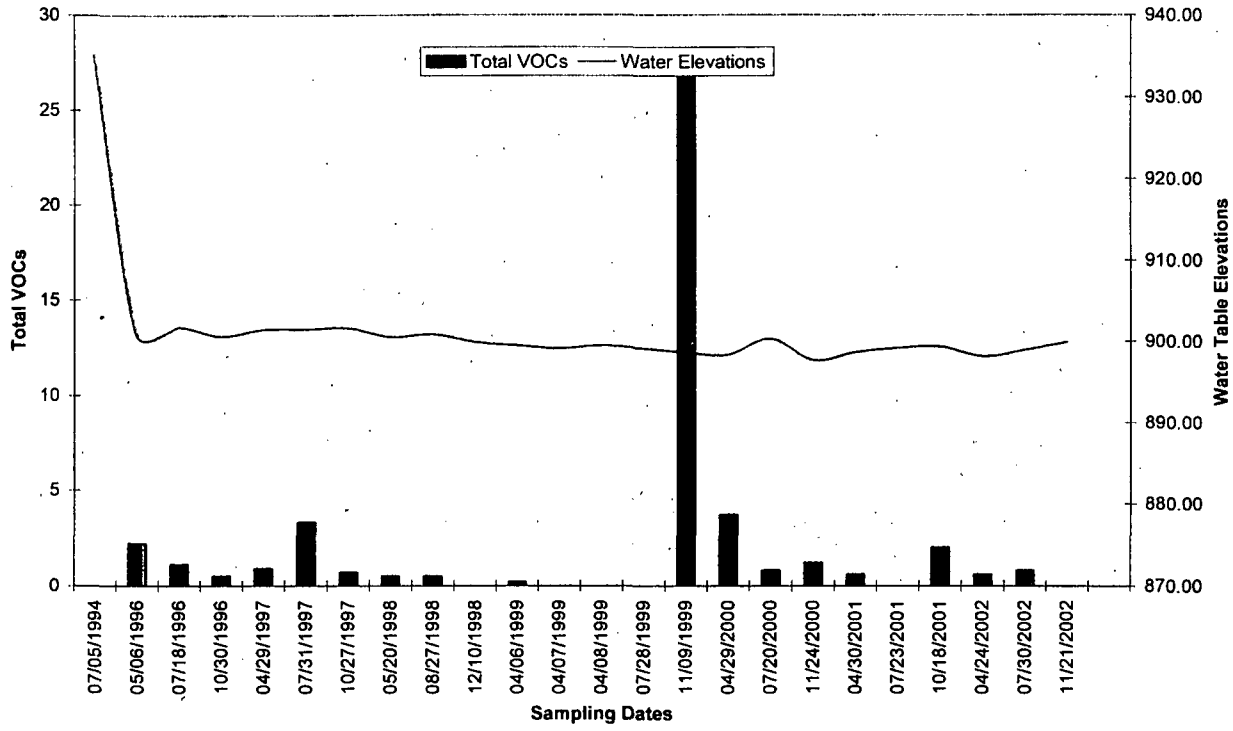


Figure 18. Washington County Sanitary Landfill
VOCs vs. Water Table Elevations - Well R1

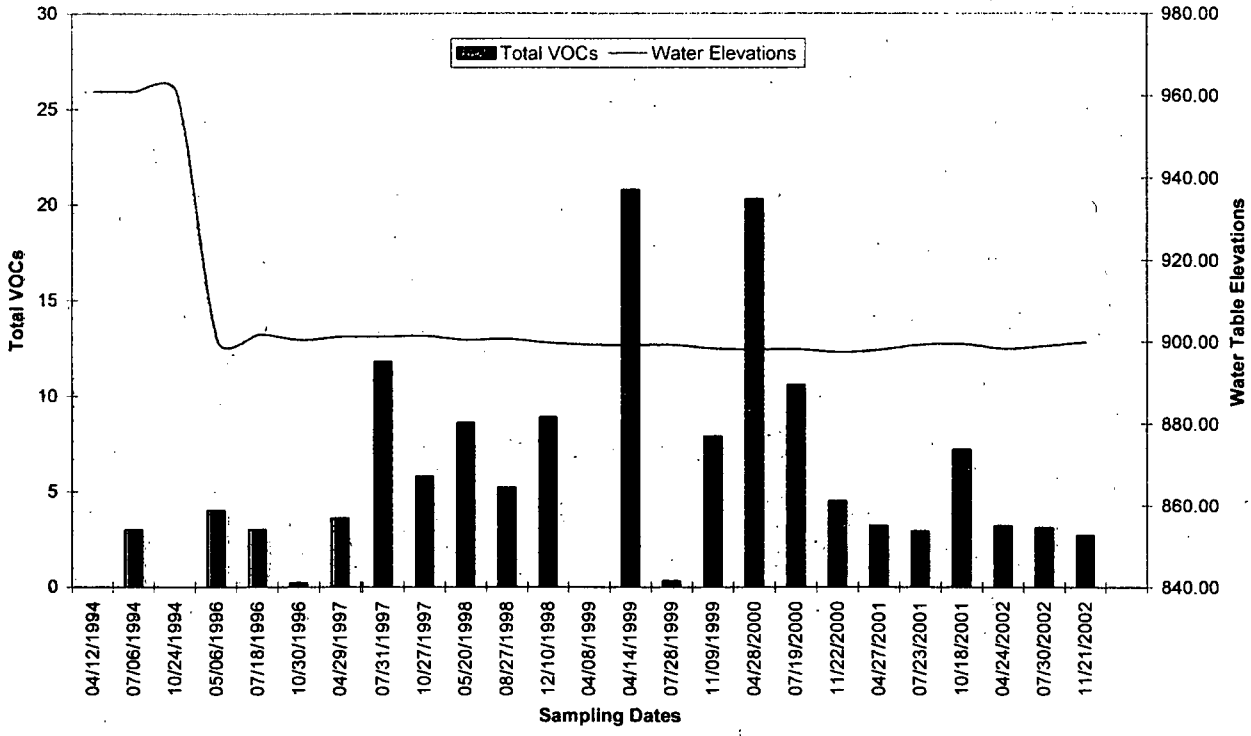


Figure 19. Washington County Sanitary Landfill
VOCs vs. Water Table Elevations - Well R2

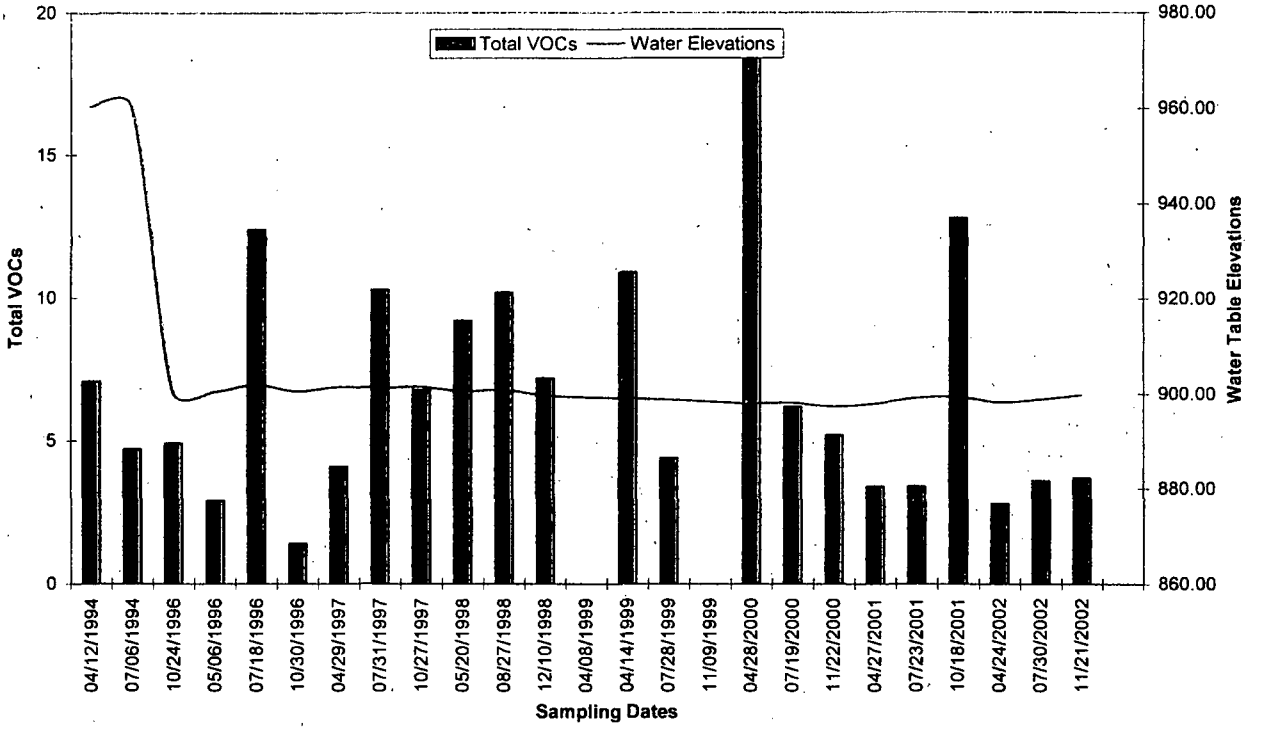


Figure 20. Washington County Sanitary Landfill
VOCs vs. Water Table Elevations - Well R3

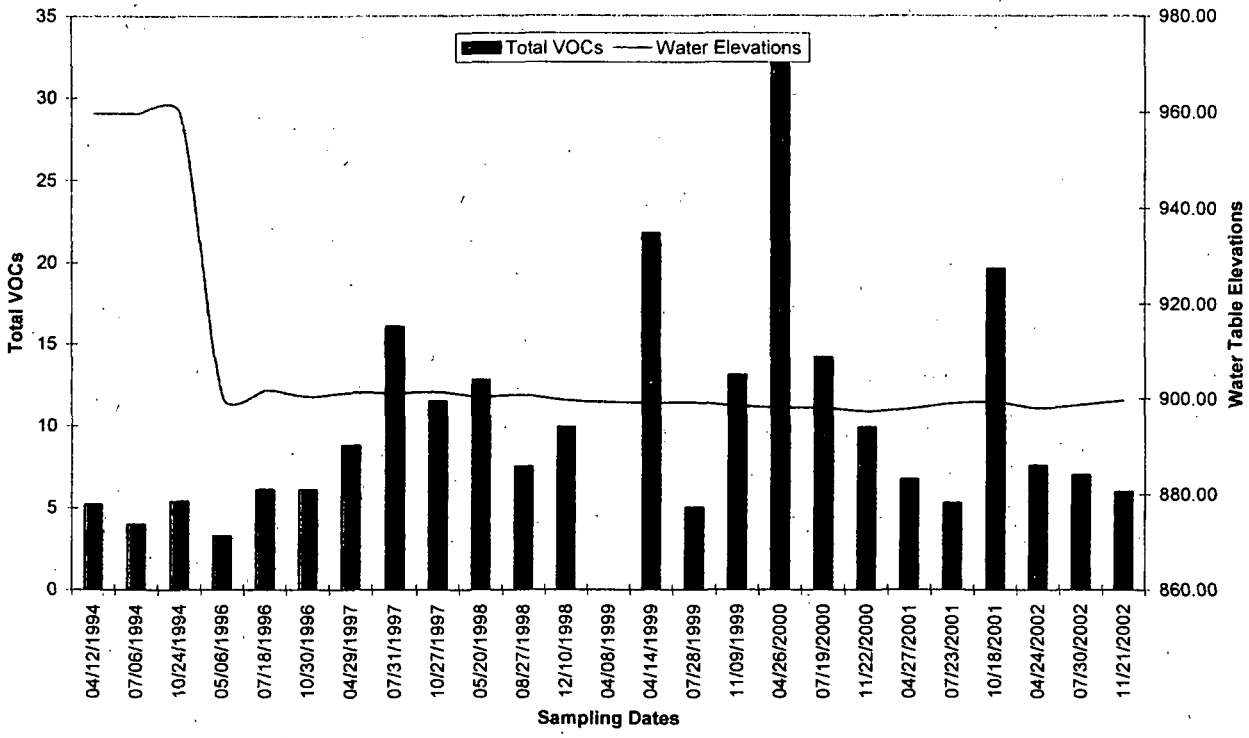


Figure 21. Washington County Sanitary Landfill
VOCs vs. Water Table Elevations - Well V

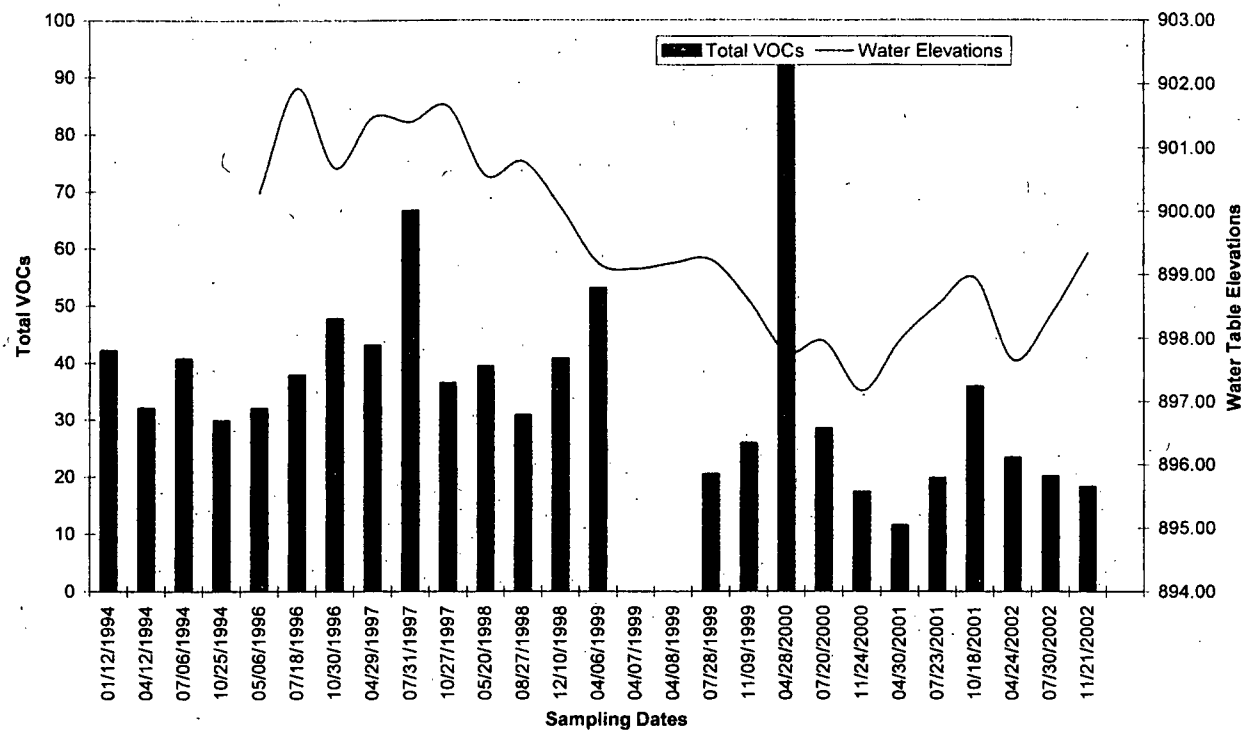


Figure 22. Washington County Sanitary Landfill
VOCs vs. Water Table Elevations - Well V2

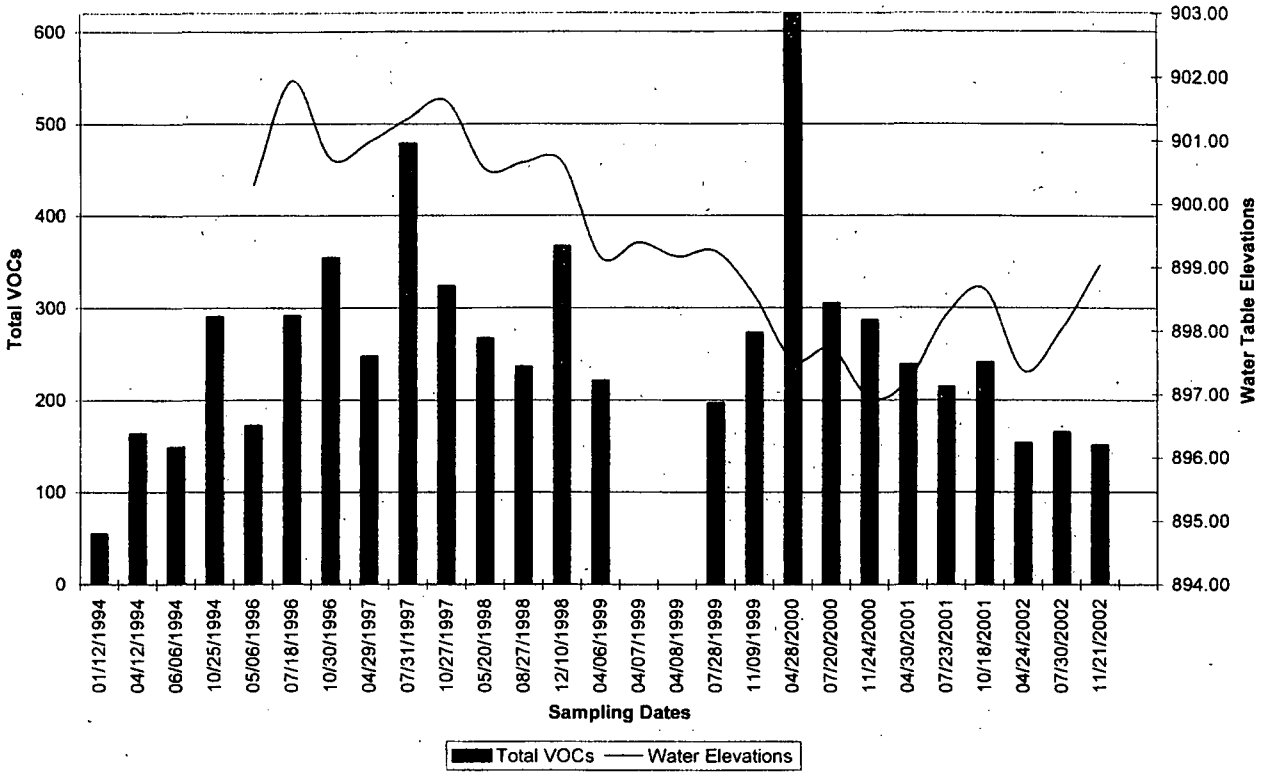


Figure 23. Daily and Monthly Precipitation around Washington County Landfill-1999 to

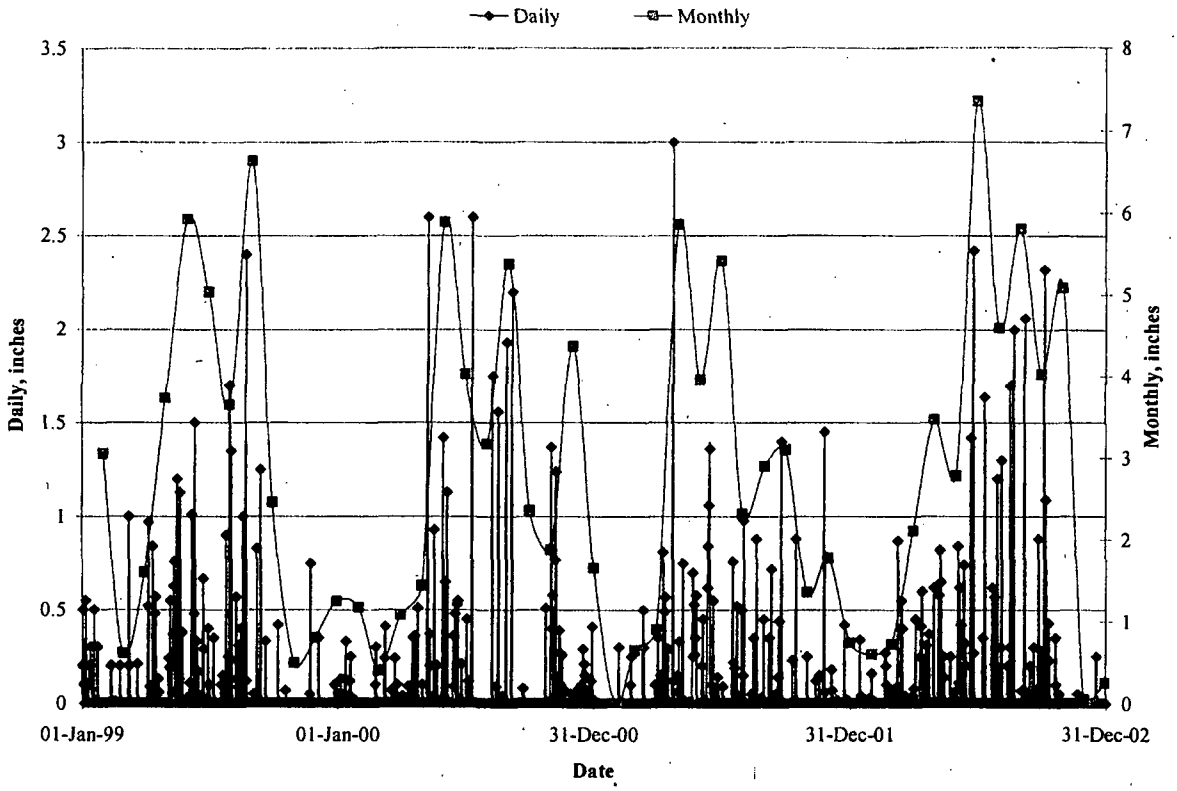


Table 1 Flare Parameters collected in 2003

COMMONSTATIONID	DATE COLLECTED	Barometric pressure (in Hg)	Carbon Dioxide (percent)	Flowrate (cfm)	Methane (percent)	Operation Hrs (None)	Oxygen (percent)	Temperature (deg F)
flare	1/8/2003			164	43	52744	0.2	1542
flare	1/17/2003			165	39	52965	0.8	1551
flare	1/20/2003			157	39.4	53037	0.7	1539
flare	1/27/2003			154	43	53201	0	1548
flare	2/4/2003			162	37	53389	0.7	1546
flare	2/10/2003			154	40	53537	1	1548
flare	2/19/2003			160	36	53748	1	1540
flare	2/28/2003			156	34	53966	0.8	1548
flare	3/6/2003		31.9	164	34	54105	1.6	1548
flare	3/13/2003		32.5	166	34	54278	0.7	1543
flare	3/21/2003		37.5	165	35	54466	0.7	1542
flare	3/26/2003		32.1	162	33.7	54582	0.8	1555
flare	3/31/2003		32.7	166	34	54698	1.4	1545
flare	4/8/2003		34.1	180	30	54887	0.8	1542
flare	4/14/2003		35.2	182	32	55028	0.6	1542
flare	4/23/2003		29.4	176	30.1	55242	0.7	1546
flare	4/29/2003		30.8	175	27.7	55379	2.2	1539
flare	5/9/2003		36.6	162	33.8	55615	0.8	1539
flare	5/13/2003			160	32.6	55717	0.2	1547
flare	5/19/2003		29.3	157	31.7	55861	0.7	1534
flare	5/28/2003		31.9	158	31.1	56074	1	1551
flare	6/3/2003		28.9	157	31.4	56216	0.4	1553
flare	6/9/2003		31.2	155	31.1	56362	0.3	1550
flare	6/20/2003		30.2	158	31.4	56618	0.5	1551
flare	6/24/2003		31.8	157	32.8	56720	0.3	1550
flare	7/2/2003	29.83	33	156	33.3	56903	0.3	
flare	7/9/2003	29.89	33.9	155	33.9	57076	0.2	
flare	7/16/2003	30.04	29.8	157	31.9	57241	0.5	
flare	7/21/2003	29.86	33.3	161	33.4	57354	0.5	
flare	7/28/2003	30.06		162	34.2	57516	0.3	
flare	8/4/2003	30.01	32.4	160	34.1	57683	0.5	
flare	8/14/2003	30.24	33.7	160	34.6	57931	0.5	
flare	8/18/2003	29.95	37.4	160	33.8	58021	1.1	
flare	8/29/2003	30.12	38.4	155	34.4	58284	1	
flare	9/2/2003	29.95	40.4	161	34.7	58380	1.1	
flare	9/8/2003	29.98	32.7	159	33.7	58523	0.9	
flare	9/15/2003	30.04	38.9	157	36.2	58686	1.1	
flare	9/24/2003	29.89	32.3	153	36.2	58906	0.8	
flare	9/30/2003	30.27	34.9	153	36.8	59047	1.1	
flare	10/6/2003	30.04	34	149	36.6	59188	1.2	
flare	10/13/2003	29.88	34.3	149	38.4	59353	0.7	
flare	10/20/2003	29.71	36.1	155	41	59428	0.5	

Table 1 Flare Parameters collected in 2003

COMMONSTATIONID	DATE COLLECTED	Barometric pressure (in Hg)	Carbon Dioxide (percent)	Flowrate (cfm)	Methane (percent)	Operation Hrs (None)	Oxygen (percent)	Temperature (deg F)
flare	10/27/2003	29.81	34.6	156	40	59593	0.6	
flare	11/4/2003	29.83	36	157	40	59782	0.2	
flare	11/13/2003	30.42	34.1	152	38.4	59977	0.8	
flare	11/17/2003	29.59	35	151	40.3	60076	0.4	
flare	11/26/2003	29.86	35.5	163	41.2	60244	0.6	
flare	12/3/2003	30.33	37.6	155	40	60413	0.9	
flare	12/11/2003	30.21	34.4	153	38.5	60601	1.5	
flare	12/17/2003	29.9	35.5	148	39.9	60749	1.2	
flare	12/23/2003	30.1	33.5	151	36.9	60886	1.1	
flare	12/29/2003	29.82	32.2	147	36.9	61036	1.1	
						8292		

Table 2 Landfill Gas Probe Monitoring Data Calendar Year 2003

COMMON STATION ID	DATE COLLECTED	Barometric pressure (in Hg)	Carbon Dioxide (percent)	Methane (percent)	Oxygen (percent)
G06A	7/16/2003	30.04	2.3	0	17.2
G06A	10/6/2003	30.04	1	0.1	19.6
G06B	7/16/2003	30.04	0.5	0	18.8
G06B	10/6/2003	30.04	0.1	0	20.4
G06C	7/16/2003	30.04	0	0	20.1
G06C	10/6/2003	30.04	0	0	20.3
G08A	7/16/2003	30.04	4	0	14.7
G08A	10/6/2003	30.04	5.3	0	15.3
G08B	7/16/2003	30.04	1.6	0	17.5
G08B	10/6/2003	30.04	1.9	0	18
G08C	7/16/2003	30.04	0	0	20.4
G08C	10/6/2003	30.04	0.3	0	20
G09A	7/16/2003	30.04	2	0	16.2
G09A	10/6/2003	30.04	4.1	0	15.5
G09B	7/16/2003	30.04	0.3	0	19.6
G09B	10/6/2003	30.04	0.3	0	20.2
G09C	7/16/2003	30.04	0	0	20.4
G09C	10/6/2003	30.04	0	0	20.5
G10A	7/16/2003	30.04	4.3	0	14.6
G10A	10/6/2003	30.04	2.4	0	18.6
G10B	7/16/2003	30.04	0.7	0	19.5
G10B	10/6/2003	30.04	1.3	0	18.7
G11A	7/16/2003	30.04	3.8	0	15.4
G11A	10/6/2003	30.04	1.6	0	19.4
G11B	7/16/2003	30.04	0	0	20.1
G11B	10/6/2003	30.04	1.2	0	19.3
G11C	7/16/2003	30.04	1.1	0	18.2
G11C	10/6/2003	30.04	2	0	18.6
G12A	7/16/2003	30.04	3.9	0	13.5
G12A	10/6/2003	30.04	3.8	0	13.3
G12B	7/16/2003	30.04	1.6	0	17.9
G12B	10/6/2003	30.04	0.9	0	19.7
G13A	7/16/2003	30.04	1	0	17.6
G13B	7/16/2003	30.04	1.2	0	15.4
MV04A	7/16/2003	30.04	3	0	16.2
MV04A	10/6/2003	30.04	1.1	0	19.6
MV04B	7/16/2003	30.04	0.6	0	19.4
MV04B	10/6/2003	30.04	3	0	16.5
MV05	7/16/2003	30.04	0.6	0	19.5
MV05	10/6/2003	30.04	0.2	0	20.4
MV07	7/16/2003	30.04	0.8	0	18.5
MV07	10/6/2003	30.04	1.6	0	18.9
MV08	7/16/2003	30.04	2.8	0	14.7
MV08	10/6/2003	30.04	6.1	0	12.7
MV11	7/16/2003	30.04	0.2	0	19.6
MV11	10/6/2003	30.04	3.1	0	17
MV13	7/16/2003	30.04	3.9	0	15
MV13	10/6/2003	30.04	3.5	0	16.9

Table 3 Analytical Data for Condensate Samples, November 2003

COMMON STATION ID	DATE COLLECTED	1,1,1,2-Tetrachloroethane (ug/L)	1,1,1-Trichloroethane (ug/L)	1,1,2,2-Tetrachloroethane (ug/L)	1,1,2-Trichloroethane (ug/L)	1,1,2-Trichlorotrifluoroethane (ug/L)	1,1-Dichloroethane (ug/L)	1,1-Dichloroethene (ug/L)	1,1-Dichloropropene (ug/L)	1,2,3-Trichlorobenzene (ug/L)	1,2,3-Trichloropropane (ug/L)	1,2,4-Trichlorobenzene (ug/L)	1,2,4-Trimethylbenzene (ug/L)	1,2-Dibromo-3-chloropropane (ug/L)	1,2-Dibromoethane (ug/L)	1,2-Dichlorobenzene (ug/L)	1,2-Dichloroethane (ug/L)	1,2-Dichloroethene, cis (ug/L)	1,2-Dichloroethene, trans (ug/L)	1,2-Dichloropropane (ug/L)	1,2-Diphenylhydrazine (ug/L)	1,3,5-Trimethylbenzene (ug/L)	1,3-Dichlorobenzene (ug/L)	1,3-Dichloropropane (ug/L)	1,3-Dichloropropene, cis (ug/L)	1,3-Dichloropropene, trans (ug/L)	1,4-Dichlorobenzene (ug/L)	2,2-Dichloropropane (ug/L)	2,4,6-Trichlorophenol (ug/L)
CT-1	11/4/2003	< 1	< 1	< 1	< 1	< 1	2.6	< 1	< 1	< 1	< 1	< 1	14	< 5	< 1	< 1	7.1	70	< 1	16	< 2	4	< 1	< 1	< 1	< 1	5.5	< 1	< 10
CT-2	11/4/2003	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	26	< 5	< 1	1.5	< 1	7.5	< 1	< 1	< 2	7.2	< 1	< 1	< 1	< 1	11	< 1	< 10
CT-3	11/4/2003	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 5	< 1	< 1	< 1	5.9	< 1	< 1	< 2	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 10

Table 3 Analytical Data for Condensate Samples, November 2003

COMMON STATION ID	DATE COLLECTED	2,4-Dichlorophenol (ug/L)	2,4-Dimethylphenol (ug/L)	2,4-Dinitrophenol (ug/L)	2,4-Dinitrotoluene (ug/L)	2,6-Dinitrotoluene (ug/L)	2-Chloronaphthalene (ug/L)	2-Chlorophenol (ug/L)	2-Chlorotoluene (ug/L)	2-Methyl-4,6-dinitrophenyl (ug/L)	2-Nitrophenol (ug/L)	4,4'-DDD (ug/L)	4,4'-DDE (ug/L)	4,4'-DDT (ug/L)
CT-1	11/4/2003	< 10	107	< 20	< 5	< 5	< 2	< 10	< 1	< 10	< 10	< 10	< 10	< 10
CT-2	11/4/2003	< 10	27	< 20	< 5	< 5	< 2	< 10	< 1	< 10	< 10	< 10	< 10	< 10
CT-3	11/4/2003	< 10	< 10	< 20	< 5	< 5	< 2	< 10	< 1	< 10	< 10	< 10	< 10	< 10

COMMON STATION ID	4-Bromophenyl phenyl ether (ug/L)	4-Chloro-3-methylphenol (ug/L)	4-Chlorophenyl phenyl ether (ug/L)	4-Chlorotoluene (ug/L)	4-Nitrophenol (ug/L)	Acenaphthene (ug/L)	Acenaphthylene (ug/L)	Acetone (ug/L)	Aldrin (ug/L)	Allyl chloride (ug/L)	Anthracene (ug/L)	Benzene (ug/L)
CT-1	< 5	< 10	< 2	< 1	< 20	< 2	< 2	40000	< 10	< 1	< 2	48
CT-2	< 5	37	< 2	< 1	< 20	< 2	< 2	42	< 10	< 1	< 2	24
CT-3	< 5	< 10	< 2	< 1	< 20	< 2	< 2	64	< 10	< 1	< 2	3.5

Table 3 Analytical Data for Condensate Samples, November 2003

COMMON STATION ID	DATE COLLECTED	Benzidine (ug/L)	Benzo(a)anthracene (ug/L)	Benzo(a)pyrene (ug/L)	Benzo(ghi)perylene (ug/L)	BHC (Lindane), g (ug/L)	BHC, a (ug/L)	BHC, b (ug/L)	BHC, d (ug/L)	Bis(2-chloroethoxy)methane (ug/L)	Bis(2-chloroethyl)ether (ug/L)	Bis(2-chloroisopropyl)ether (ug/L)	Bis(2-ethylhexyl)phthalate (ug/L)	Bromobenzene (ug/L)	Bromochloromethane (ug/L)	Bromodichloromethane (ug/L)	Bromoform (ug/L)	Bromomethane (ug/L)	Butyl benzyl phthalate (ug/L)	Butylbenzene, n (ug/L)	Butylbenzene, sec (ug/L)	Butylbenzene, tert (ug/L)	Carbon tetrachloride (ug/L)	Chemical Oxygen Demand, Total (mg/L)	Chlordane (ug/L)	Chlorobenzene (ug/L)	Chlorodibromomethane (ug/L)
CT-1	11/4/2003	< 10	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 2	< 5	< 2	< 10	< 1	< 1	< 1	< 1	< 2	< 10	< 1	< 1	< 1	< 1	2700	< 200	1.8	< 1
CT-2	11/4/2003	< 10	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 2	< 5	< 2	< 10	< 1	< 1	< 1	< 1	< 2	< 10	< 1	< 1	< 1	< 1	60	< 200	17	< 1
CT-3	11/4/2003	< 10	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 2	< 5	< 2	< 10	< 1	< 1	< 1	< 1	< 2	< 10	< 1	< 1	< 1	< 1	26	< 200	< 1	< 1

Table 3 Analytical Data for Condensate Samples, November 2003

COMMON STATION ID	DATE COLLECTED	Chloroethane (ug/L)	Chloroform (ug/L)	Chloromethane (ug/L)	Chrysene (ug/L)	Dibenzo(a,h)anthracene (ug/L)	Dibromomethane (ug/L)	Dichlorodifluoromethane (ug/L)	Dichlorofluoromethane (ug/L)	Dieldrin (ug/L)	Diethyl phthalate (ug/L)	Dimethyl phthalate (ug/L)	Di-n-butyl phthalate (ug/L)	Di-n-octyl phthalate (ug/L)	Endosulfan I (ug/L)	Endosulfan II (ug/L)	Endosulfan sulfate (ug/L)	Endrin (ug/L)	Endrin aldehyde (ug/L)	Ethyl ether (ug/L)	Ethylbenzene (ug/L)	Fluoranthene (ug/L)	Fluorene (ug/L)	Heptachlor (ug/L)	Heptachlor epoxide (ug/L)	Hexachlorobenzene (ug/L)
CT-1	11/4/2003	1.2	< 1	< 1	< 2	< 5	< 1	< 1	2.5	< 10	181	< 2	< 10	< 10	< 10	< 50	< 10	< 10	< 10	420	88	< 2	< 2	< 10	< 10	< 2
CT-2	11/4/2003	< 1	< 1	< 1	< 2	< 5	< 1	< 1	1	< 10	21	< 2	< 10	< 10	< 10	< 50	< 10	< 10	< 10	180	150	< 2	< 2	< 10	< 10	< 2
CT-3	11/4/2003	< 1	< 1	< 1	< 2	< 5	< 1	< 1	< 1	< 10	< 10	< 2	12	< 10	< 10	< 50	< 10	< 10	< 10	22	7.4	< 2	< 2	< 10	< 10	< 2

Table 3 Analytical Data for Condensate Samples, November 2003

COMMON STATION ID	DATE COLLECTED	Hexachlorobutadiene (ug/L)	Hexachlorocyclopentadiene (ug/L)	Indeno(1,2,3-cd)pyrene (ug/L)	Isophorone (ug/L)	Isopropylbenzene (ug/L)	Isopropyltoluene, p (ug/L)	Methyl ethyl ketone (ug/L)	Methyl isobutyl ketone (ug/L)	Methyl tertiary butyl ether (ug/L)	Methylene chloride (ug/L)	Naphthalene (ug/L)	Nitrobenzene (ug/L)	N-Nitrosodimethylamine (ug/L)	N-Nitroso-di-n-propylamine (ug/L)	Pentachlorophenol (PCP) (ug/L)	PH (Lab) (Std Units)	Phenanthrene (ug/L)	Phenol (ug/L)	Propylbenzene, n (ug/L)	Pyrene (ug/L)	Solids, Suspended (mg/L)	Styrene (ug/L)	Tetrachloroethene (ug/L)	Tetrahydrofuran (ug/L)
CT-1	11/4/2003	< 1	< 10	< 5	8100	2.6	6.2	55000	1900	< 2	24	12	< 5	< 10	< 10	< 10	5.2	< 2	1790	2.1	< 2	4	< 1	2.2	1400
CT-2	11/4/2003	< 1	< 10	< 5	97	5.3	13	150	27	< 2	< 2	15	< 5	< 10	< 10	< 10	6.1	< 2	< 10	3.4	< 2	210	< 1	< 1	440
CT-3	11/4/2003	< 1	< 10	< 5	216	< 1	< 1	470	54	< 2	< 2	< 1	< 5	< 10	< 10	< 10	6.7	< 2	26	< 1	< 2	23	< 1	< 1	27

Table 3 Analytical Data for Condensate Samples, November 2003

COMMON STATION ID	DATE COLLECTED	Toluene (ug/L)	Trichloroethene (ug/L)	Trichlorofluoromethane (ug/L)	Vinyl chloride (ug/L)	Xylene, m & p (ug/L)	Xylene, o (ug/L)
CT-1	11/4/2003	140	6.8	< 1	4.6	270	98
CT-2	11/4/2003	33	< 1	< 1	1.1	340	82
CT-3	11/4/2003	8.6	< 1	< 1	< 1	11	5.5

Table 5 Ground water elevations, Year 2003

COMMON	RESULT	DATECOLLE	UTMEAST	UTMNORT Meters
GC3	899.55	1/9/2003	506396.6	4983564
GC3	899.2	2/11/2003	506396.6	4983564
GC3	898.94	3/6/2003	506396.6	4983564
L	899.26	4/3/2003	506392.3	4984200
A	899.12	4/3/2003	506030.8	4983951
R2	898.42	4/3/2003	506409	4983519
Q2	898.31	4/3/2003	506029.2	4983551
BB2	897.18	4/3/2003	506215.8	4982915
AA	896.74	4/3/2003	506570.5	4982908
EE	898.03	4/3/2003	506227.8	4983298
V2	898.67	4/3/2003	506285.9	4983568
DD	896.14	4/3/2003	506128	4982473
GC3	898.28	4/29/2003	506396.6	4983564
GC3	898.78	5/28/2003	506396.6	4983564
GC3	898.73	6/9/2003	506396.6	4983564
GC3	899.1	7/2/2003	506396.6	4983564
L	899.27	7/8/2003	506392.3	4984200
A	899.14	7/8/2003	506030.8	4983951
GC3	898.72	7/8/2003	506396.6	4983564
R2	898.51	7/8/2003	506409	4983519
Q2	898.38	7/8/2003	506029.2	4983551
BB2	897.72	7/8/2003	506215.8	4982915
AA	897.29	7/8/2003	506570.5	4982908
EE	898.11	7/8/2003	506227.8	4983298
V2	898.76	7/8/2003	506285.9	4983568
DD	896.87	7/8/2003	506128	4982473
GC3	898.47	8/4/2003	506396.6	4983564
GC3	897.77	9/15/2003	506396.6	4983564
L	898.4	10/16/2003	506392.3	4984200
A	898.26	10/16/2003	506030.8	4983951
V2	897.78	10/16/2003	506285.9	4983568
GC3	897.78	10/16/2003	506396.6	4983564
R2	897.55	10/16/2003	506409	4983519
Q2	897.37	10/16/2003	506029.2	4983551
EE	897.04	10/16/2003	506227.8	4983298
BB2	896.4	10/16/2003	506215.8	4982915
AA	896.11	10/16/2003	506570.5	4982908
BB3	897.16	4/3/2003	506215.8	4982915
Q3	898.54	4/3/2003	506029.2	4983550
R3	898.36	4/3/2003	506409	4983518
BB3	897.68	7/8/2003	506215.8	4982915
Q3	898.52	7/8/2003	506029.2	4983550
R3	898.48	7/8/2003	506409	4983518
BB3	897.68	7/8/2003	506215.8	4982915
Q3	898.52	7/8/2003	506029.2	4983550
R3	898.48	7/8/2003	506409	4983518
BB3	896.37	10/16/2003	506215.8	4982915
Q3	897.55	10/16/2003	506029.2	4983550
R3	897.49	10/16/2003	506409	4983518
BB3	896.37	10/16/2003	506215.8	4982915
Q3	897.55	10/16/2003	506029.2	4983550

Table 5 Ground water elevations, Year 2003

COMMON	RESULT	DATECOLLE	UTMEAST	UTMNORT	Meters
R3	897.49	10/16/2003	506409	4983518	
E	898.73	4/3/2003	506519.9	4983584	273.9329
P1	917.74	4/3/2003	506456.1	4983643	279.7272
P3	899.38	4/3/2003	506738.6	4983690	274.131
P2	898.96	4/3/2003	506568.5	4983669	274.003
Q1	898.22	4/3/2003	506029.2	4983552	273.7775
R1	898.43	4/3/2003	506409	4983520	273.8415
V	898.41	4/3/2003	506275.3	4983575	273.8354
C	899.29	7/8/2003	506339.1	4984106	274.1036
J	899.27	7/8/2003	506021.6	4984079	274.0975
E	898.87	7/8/2003	506519.9	4983584	273.9756
P1	919.45	7/8/2003	506456.1	4983643	280.2484
P3	895.5	7/8/2003	506738.6	4983690	272.9484
P2	899.07	7/8/2003	506568.5	4983669	274.0365
Q1	898.25	7/8/2003	506029.2	4983552	273.7866
R1	898.51	7/8/2003	506409	4983520	273.8658
V	898.5	7/8/2003	506275.3	4983575	273.8628
W	897.82	7/8/2003	506206.9	4983114	273.6555
2003-B3	899.59	7/8/2003	506047.8	4983999	274.195
2003-B2	899.22	7/8/2003	506076.1	4984034	274.0823
2003-B1	899.91	7/8/2003	506029.6	4984076	274.2926
C	899.29	7/8/2003	506339.1	4984106	274.1036
J	899.27	7/8/2003	506021.6	4984079	274.0975
E	898.87	7/8/2003	506519.9	4983584	273.9756
P1	919.45	7/8/2003	506456.1	4983643	280.2484
P3	895.5	7/8/2003	506738.6	4983690	272.9484
P2	899.07	7/8/2003	506568.5	4983669	274.0365
Q1	898.25	7/8/2003	506029.2	4983552	273.7866
R1	898.51	7/8/2003	506409	4983520	273.8658
V	898.5	7/8/2003	506275.3	4983575	273.8628
W	897.82	7/8/2003	506206.9	4983114	273.6555
2003-B3	899.59	7/8/2003	506047.8	4983999	274.195
2003-B2	899.22	7/8/2003	506076.1	4984034	274.0823
2003-B1	899.91	7/8/2003	506029.6	4984076	274.2926
C	898.5	10/16/2003	506339.1	4984106	273.8628
J	898.39	10/16/2003	506021.6	4984079	273.8293
E	898.04	10/16/2003	506519.9	4983584	273.7226
P1	919.38	10/16/2003	506456.1	4983643	280.227
P2	898.2	10/16/2003	506568.5	4983669	273.7714
Q1	897.34	10/16/2003	506029.2	4983552	273.5092
R1	897.62	10/16/2003	506409	4983520	273.5946
V	897.54	10/16/2003	506275.3	4983575	273.5702
W	896.79	10/16/2003	506206.9	4983114	273.3416
2003-B3	898.73	10/16/2003	506047.8	4983999	273.9329
2003-B2	898.37	10/16/2003	506076.1	4984034	273.8232
2003-B1	898.39	10/16/2003	506029.6	4984076	273.8293
V-WT	903.46	10/16/2003	506274.2	4983551	275.3746
C-WT	898.62	10/16/2003	506337.3	4984092	273.8994
R-WT	915.64	10/16/2003	506406.9	4983503	279.0871
E-WT	919.57	10/16/2003	506503.1	4983569	280.2849
GC3-WT	917.19	10/16/2003	506391.1	4983559	279.5595

Table 5 Ground water elevations, Year 2003

COMMON	RESULT	DATECOLLE	UTMEAST	UTMNORT	Meters
Q-WT	899.49	10/16/2003	506033.1	4983530	274.1646
C	898.5	10/16/2003	506339.1	4984106	273.8628
J	898.39	10/16/2003	506021.6	4984079	273.8293
E	898.04	10/16/2003	506519.9	4983584	273.7226
P1	919.38	10/16/2003	506456.1	4983643	280.227
P2	898.2	10/16/2003	506568.5	4983669	273.7714
Q1	897.34	10/16/2003	506029.2	4983552	273.5092
R1	897.62	10/16/2003	506409	4983520	273.5946
V	897.54	10/16/2003	506275.3	4983575	273.5702
W	896.79	10/16/2003	506206.9	4983114	273.3416
2003-B3	898.73	10/16/2003	506047.8	4983999	273.9329
2003-B2	898.37	10/16/2003	506076.1	4984034	273.8232
2003-B1	898.39	10/16/2003	506029.6	4984076	273.8293
V-WT	903.46	10/16/2003	506274.2	4983551	275.3746
C-WT	898.62	10/16/2003	506337.3	4984092	273.8994
R-WT	915.64	10/16/2003	506406.9	4983503	279.0871
E-WT	919.57	10/16/2003	506503.1	4983569	280.2849
GC3-WT	917.19	10/16/2003	506391.1	4983559	279.5595
Q-WT	899.49	10/16/2003	506033.1	4983530	274.1646
2003-B3	898.1	12/2/2003	506047.8	4983999	273.741
2003-B2	898.12	12/2/2003	506076.1	4984034	273.747
2003-B1	898.13	12/2/2003	506029.6	4984076	273.750
C-WT	898.38	12/2/2003	506337.3	4984092	273.826
J	898.12	12/2/2003	506021.6	4984079	273.747
I	898.23	12/2/2003	506026.2	4984030	273.781

Table 6 Total Volatile Organic Compounds calculated at each well, Year 2003

STARTDATE	2003-B2	2003-B3	AA	BB2	C-WT	C	D1	DD	E-WT	E
4/3/2003			0.8000	9.7000		1.0000				4.0000
7/8/2003	10.7000	36.1000					3.4000	11.0000		2.7000
10/16/2003	29.4000	30.1000			22.0000		3.6000		2.7000	1.6000
	EE	**GC1**	**I**	**L**	**P1**	**Q1**	**Q2**	**Q3**	**R-WT**	**R1**
4/3/2003	41.4000			2.3000		0.1000	0.5000	0.6000		4.0000
7/8/2003	36.5000	24.2000	47.8000	1.3000	2.7000					2.5000
10/16/2003	25.2000	24.1000	56.3000	1.6000				1.6000	3.6000	5.3000
	R2	**R3**	**TA-1**	**Trip Blan**	**V**	**V2**	**Z**			
4/3/2003	4.9000	8.5000	26.1000	56.0000	28.1000	139.5000	5.5000			
7/8/2003	3.3000	4.7000	31.5000		17.1000	133.9000	4.1000			
10/16/2003	7.4000	8.2000			12.7000	81.3000	4.0000			

VERTICAL GRADIENT REPORT
FACILITY: WASHINGTON COUNTY SANITARY LANDFILL
DATE: 10/16/2003

STATION	LIQUID ELEVATION	MEASURING POINT ELEVATION	DEPTH TO SCREEN TOP	DEPTH TO SCREEN BOTTOM	SCREEN MIDPOINT	GRADIENT
C-WT	898.62	947.00	48.00	58.00	894.00	
						0.0001
C	898.50	953.80				
E-WT	919.57	948.23	24.00	34.00	919.23	
						0.0234
E	898.04	949.38		93.00		
Q-WT	899.49	932.12	26.00	36.00	901.12	
						0.0631
Q1	897.34	932.55	63.50	67.50	867.05	
						-0.0016
Q2	897.37	933.38	83.50	87.50	847.88	
						-0.0054
Q3	897.55	934.36	113.50	126.00	814.61	
R-WT	915.64	960.15	50.00	60.00	905.15	
						0.7100
R1	897.62	960.27	78.50	82.50	879.77	
						0.0027
R2	897.55	959.68	103.50	107.50	854.18	
						0.0035
R3	897.49	958.91	117.50	126.00	837.16	
V-WT	903.46	948.02	40.00	50.00	903.02	
						1.3094
V	870.70	948.00	66.00	74.00	878.00	
						-1.0082
V2	897.78	949.14	93.00	103.00	851.14	

Table 8 Compliance with Applicable and Relevant or Appropriate Requirements

COMMON STATION ID	DATE COLLECTED	PARAMETER NAME	METHOD	CAS NUMBER	RESULT	UNITS	LIMIT
R3	3-Apr-03	Manganese	SW 6010	7439-96-5	1500	ug/L	1000
V	3-Apr-03	Vinyl chloride	SW 8260	27398	0.7	ug/L	0.2
V2	3-Apr-03	Manganese	SW 6010	7439-96-5	4500	ug/L	1000
EE	3-Apr-03	Vinyl chloride	SW 8260	27398	1	ug/L	0.2
I	8-Jul-03	Vinyl chloride	SW 8260	27398	1.7	ug/L	0.2
2003-B3	9-Jul-03	Vinyl chloride	SW 8260	27398	1.9	ug/L	0.2
R3	9-Jul-03	Manganese	SW 6010	7439-96-5	1600	ug/L	1000
V2	9-Jul-03	Manganese	SW 6010	7439-96-5	4400	ug/L	1000
EE	9-Jul-03	Vinyl chloride	SW 8260	27398	1.1	ug/L	0.2
I	16-Oct-03	Vinyl chloride	SW 8260	27398	1.5	ug/L	0.2
2003-B2	16-Oct-03	Vinyl chloride	SW 8260	27398	1.5	ug/L	0.2
2003-B3	17-Oct-03	Vinyl chloride	SW 8260	27398	1.5	ug/L	0.2
V	16-Oct-03	Manganese	SW 6010	7439-96-5	1200	ug/L	1000
V2	16-Oct-03	Manganese	SW 6010	7439-96-5	3800	ug/L	1000
R-WT	16-Oct-03	Manganese	SW 6010	7439-96-5	1200	ug/L	1000
R3	16-Oct-03	Manganese	SW 6010	7439-96-5	1500	ug/L	1000

Table 9 Monthly Volume Pumped from GC-1 and Pounds of VOCs removed

Station	Date Collected	Volume Pumped (gallons)	Total VOCs	Avg VOCs	Total Pounds of VOCs	Pumping Rate (gpm)
GC1	1/31/2003	0				
GC1	2/28/2003	3119664				77
GC1	3/31/2003	4665971				105
GC1	4/30/2003	5098174				118
GC1	5/31/2003	4902015				110
GC1	6/30/2003	3632740				84
GC1	7/31/2003	4192994	24.2			94
GC1	8/31/2003	4870942		24.15		109
GC1	9/30/2003	4515462				105
GC1	10/31/2003	4569550	24.1			102
GC1	11/30/2003	4311938				100
GC1	12/31/2003	4163705				93
TOTAL		48,043,155			9.68	99.7